
North Dakota Welding

Content Standards

Approved and Adopted
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North Dakota Department of Career and Technical Education

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The North Dakota State Board for Career and Technical Education has reviewed this standards document, approved the content, and officially adopted the material until 2010.

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Welding
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North Dakota Welding Standards

Introduction

The North Dakota Department of Career and Technical Education is committed to working on standards to ensure that each program area can offer courses that allow students to acquire knowledge and skills. CTE not only provides technical skills and knowledge for students to succeed in careers, but also cross-functional workplace skills such as teamwork, problem solving, and the ability to find and use information, and provides the context in which traditional educational goals and academic skills can be enhanced.

The standards process is one that directly involves the state supervisor(s), the curriculum administrator for this agency, and teachers working directly with the content at hand. Once the standards are written and expectations are clearly defined, the standards are then compared and aligned with national and industry standards.

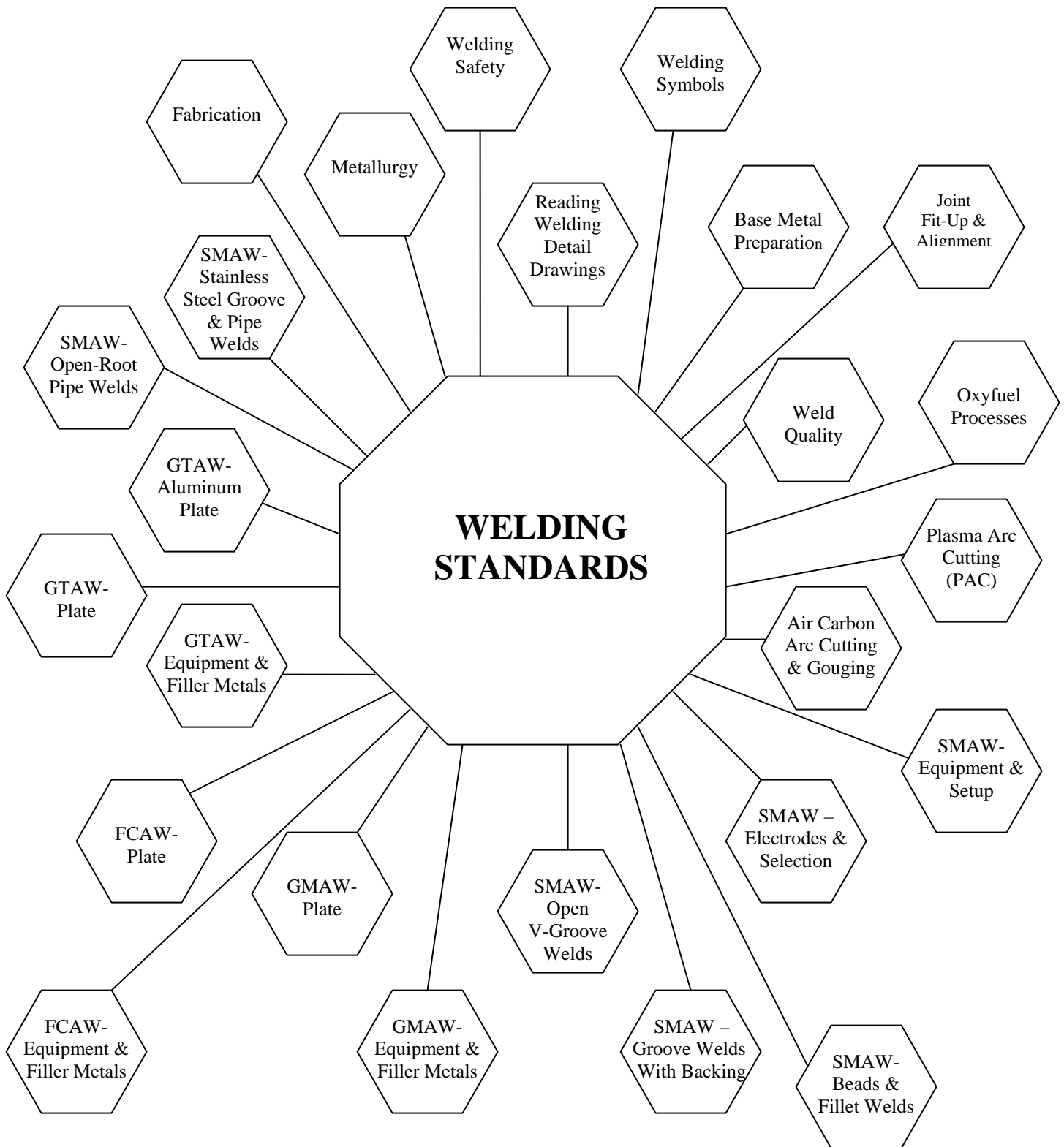
The Department of Career and Technical Education strongly believes in the importance of academic integration within each program area. The standards produced for each program area will be cross walked with the most current academic drafts of English Language Arts, Mathematics, and Science. When possible, standards will be cross walked with other academic areas that correspond.

Definitions

For each standard, there is one or more topic statements along with competencies for each topic. The competencies are categorized into three divisions: Introductory, Core, and Advanced. These divisions can further be defined as:

| | |
|---------------|---|
| Introductory: | Knowledge Acquisition—Learners at this level expand awareness and build comprehension of knowledge. |
| Core: | Application—Learners at this level experience acquired knowledge by applying it to situations and self. |
| Advanced: | Reflection—Learners at this level analyze, synthesize, judge, assess, and evaluate knowledge in accord with their own goals, values, and beliefs, and/or real situations. |

Overview of Standards



Standards at a Glance

COMPREHENSIVE STANDARDS

- | | |
|---|---|
| <p>1.0 WELDING SAFETY</p> <ul style="list-style-type: none"> Identify general safety considerations that apply to welding. <p>2.0 WELDING SYMBOLS</p> <ul style="list-style-type: none"> Recognize welding symbols and interpret meaning. <p>3.0 READING WELDING DETAIL DRAWINGS</p> <ul style="list-style-type: none"> Identify, interpret, and practice reading welding detail drawings. <p>4.0 BASE METAL PREPARATION</p> <ul style="list-style-type: none"> Analyze general information, procedures, and techniques that apply to base metal preparation. <p>5.0 JOINT FIT-UP AND ALIGNMENT</p> <ul style="list-style-type: none"> Examine codes, procedures, and uses for joint fit-up and alignment. <p>6.0 WELD QUALITY</p> <ul style="list-style-type: none"> Examine codes, conditions, and practices that apply to weld quality and analyses. <p>7.0 OXYFUEL PROCESSES</p> <ul style="list-style-type: none"> Identify and explain equipment, equipment set up, and techniques that apply to oxyfuel processes. <p>8.0 PLASMA ARC CUTTING (PAC)</p> <ul style="list-style-type: none"> Understand the set up, processes, and maintenance of plasma arc cutting equipment and procedures. <p>9.0 AIR CARBON ARC CUTTING AND GOUGING</p> <ul style="list-style-type: none"> Identify the steps for installation, preparation, and operation of air carbon arc cutting and gouging equipment. <p>10.0 SHIELDED METAL ARC WELDING (SMAW) – EQUIPMENT AND SETUP</p> <ul style="list-style-type: none"> Identify and explain equipment, equipment set up, and electrical current that apply to shielded metal arc welding. <p>11.0 SHIELDED METAL ARC WELDING (SMAW) – ELECTRODES AND SELECTION</p> <ul style="list-style-type: none"> Identify and explain classifications and electrode selection for shielded metal arc welding. <p>12.0 SHIELDED METAL ARC WELDING (SMAW) – BEADS AND FILLET WELDS</p> <ul style="list-style-type: none"> Identify and explain methods, complications, preventative measures, and techniques that apply to bead and fillet welds. <p>13.0 SHIELDED METAL ARC WELDING (SMAW) – GROOVE WELDS WITH BACKING</p> <ul style="list-style-type: none"> Explain and practice methods and positions for groove welds with backing. | <p>14.0 SHIELDED METAL ARC WELDING (SMAW) – OPEN V-GROOVE WELDS</p> <ul style="list-style-type: none"> Identify procedures to prepare and perform open v-groove welds. <p>15.0 GAS METAL ARC WELDING (GMAW) – EQUIPMENT AND FILLER METALS</p> <ul style="list-style-type: none"> Explain the equipment and filler metals that apply to gas metal arc welding. <p>16.0 GAS METAL ARC WELDING (GMAW) – PLATE</p> <ul style="list-style-type: none"> Identify and explain the equipment and weld types that apply to gas metal arc welding. <p>17.0 FLUX CORE AND/OR METAL CORE WIRE (FCAW) – EQUIPMENT AND FILLER METALS</p> <ul style="list-style-type: none"> Explain the equipment and filler metals that apply to flux cored arc welding. <p>18.0 FLUX CORE AND/OR METAL CORE WIRE (FCAW) – PLATE</p> <ul style="list-style-type: none"> Identify and explain the equipment and weld types that apply to flux cored arc welding. <p>19.0 GAS TUNGSTUN ARC WELDING (GTAW) – EQUIPMENT AND FILLER MATERIALS</p> <ul style="list-style-type: none"> Explain the equipment and filler materials that apply to gas tungsten arc welding. <p>20.0 GAS TUNGSTUN ARC WELDING (GTAW) – PLATE</p> <ul style="list-style-type: none"> Identify and explain the equipment and weld types that apply to gas tungsten arc welding. <p>21.0 GAS TUNGSTUN ARC WELDING (GTAW) – ALUMINUM PLATE</p> <ul style="list-style-type: none"> Identify and explain the equipment, characteristics, and weld types that apply to gas tungsten arc welding when using aluminum. <p>22.0 SHIELDED METAL ARC WELDING (SMAW) – OPEN-ROOT PIPE WELDS</p> <ul style="list-style-type: none"> Identify procedures and techniques that apply to open-root pipe welds. <p>23.0 SHIELDED METAL ARC WELDING (SMAW) – STAINLESS STEEL GROOVE AND PIPE WELDS</p> <ul style="list-style-type: none"> Explain the preparation, processes, and positions of stainless steel groove pipe welds. <p>24.0 FABRICATION</p> <ul style="list-style-type: none"> Identify and practice basic fabrication skills. <p>25.0 METALLURGY</p> <ul style="list-style-type: none"> Recognize and use principles of metallurgy. |
|---|---|

Standard with Topics

CONTENT STANDARDS

1.0 WELDING SAFETY

- Identify general safety considerations that apply to welding.
 - 1.1 Identify some common hazards in welding.
 - 1.2 Explain and identify proper personal protection used in welding.
 - 1.3 Analyze ways to avoid welding fumes.
 - 1.4 Identify causes of accidents and preventative methods.
 - 1.5 Demonstrate safety techniques for storing and handling cylinders.
 - 1.6 Identify and explain uses for material safety data sheets.
 - 1.7 Explain how to avoid electric shock when welding.
 - 1.8 Demonstrate proper material handling methods.
-

2.0 WELDING SYMBOLS

- Recognize welding symbols and interpret meaning.
 - 2.1 Identify and explain the various parts of a welding symbol.
 - 2.2 Identify and explain fillet and groove weld symbols.
 - 2.3 Analyze welding symbols on drawings, specifications, and welding procedure specifications (WPSs).
 - 2.4 Interpret welding symbols from print.
-

3.0 READING WELDING DETAIL DRAWINGS

- Identify, interpret, and practice reading welding detail drawings.
 - 3.1 Identify and explain a welding detail drawing.
 - 3.2 Identify and explain lines, material fills, and sections.
 - 3.3 Identify and explain object views.
 - 3.4 Identify and explain dimensioning.
 - 3.5 Develop basic welding drawings.
 - 3.6 Identify and explain notes and bill of materials.
-

4.0 BASE METAL PREPARATION

- Analyze general information, procedures, and techniques that apply to base metal preparation.
 - 4.1 Clean base metal for welding or cutting.
 - 4.2 Identify and explain joint design.
 - 4.3 Introduce joint preparation methods and explain how to identify joint specifications.
-

5.0 JOINT FIT-UP AND ALIGNMENT

- Examine codes, procedures, and uses for joint fit-up and alignment.
 - 5.1 Identify and explain job code specifications.
 - 5.2 Explain the uses of fit-up gauges and measuring devices to check joint fit-up.
 - 5.3 Identify and explain how to fit up joints using plate and pipe fit-up tools.
 - 5.4 Identify and explain distortion and how it is controlled.
 - 5.5 Identify the steps to check for joint misalignment and poor fit-up before and after welding.
-

6.0 WELD QUALITY

- Examine codes and practices that apply to weld quality and analyses.
 - 6.1 Identify and explain codes governing welding.
 - 6.2 Identify and explain weld imperfections and their causes.
 - 6.3 Identify and explain nondestructive examination practices.
 - 6.4 Identify common destructive testing methods.
 - 6.5 Identify and explain welder qualification tests.
 - 6.6 Explain the importance of quality workmanship.
-

CONTENT STANDARDS CONTINUED...

7.0 OXYFUEL PROCESSES

- Identify and explain equipment, equipment set up, and techniques that apply to oxyfuel processes.
 - 7.1 Identify and explain the use of oxyfuel cutting equipment.
 - 7.2 Identify the steps for set up of oxyfuel equipment.
 - 7.3 Identify the steps to light and adjust an oxyfuel torch.
 - 7.4 Identify the steps to shut down and disassemble oxyfuel cutting equipment.
 - 7.5 Perform oxyfuel cutting, heating, and welding.
 - 7.6 Operate a motorized, portable oxyfuel gas cutting machine.

8.0 PLASMA ARC CUTTING (PAC)

- Understand the set up, processes, and maintenance of plasma arc cutting (PAC) equipment and procedures.
 - 8.1 Identify and understand PAC processes.
 - 8.2 Identify PAC equipment.
 - 8.3 Identify steps to prepare and set up PAC equipment.
 - 8.4 Use PAC equipment to make various types of cuts.
 - 8.5 Identify the process to properly store equipment and clean the work area after use.

9.0 AIR CARBON ARC CUTTING AND GOUGING

- Identify the steps for installation, preparation, and operation of air carbon arc cutting and gouging equipment.
 - 9.1 Identify and explain the air carbon arc cutting (CAC-A) process and equipment.
 - 9.2 Identify steps to select and install CAC-A electrodes.
 - 9.3 Identify steps to prepare the work area and CAC-A equipment for safe operation.
 - 9.4 Use CAC-A equipment for washing and gouging activities.

10.0 SHIELDED METAL ARC WELDING (SMAW) – EQUIPMENT AND SETUP

- Identify and explain equipment, equipment set up, and electrical current that apply to shielded metal arc welding.
 - 10.1 Identify and explain SMAW safety.
 - 10.2 Identify and explain welding electrical current.
 - 10.3 Identify and explain arc welding machines.
 - 10.4 Explain setting up engine driven arc welding equipment.
 - 10.5 Identify and explain tools for weld cleaning.

11.0 SHIELDED METAL ARC WELDING (SMAW) – ELECTRODES AND SELECTION

- Identify and explain classifications and electrode selection for shielded metal arc welding
 - 11.1 Identify factors that affect electrode selection.
 - 11.2 Explain the American Welding Society (AWS) and the American Society of Mechanical Engineers (ASME) filler metal classification system.
 - 11.3 Identify and select the proper electrode for an identified welding task.
 - 11.4 Identify different types of filler metals.
 - 11.5 Explain the storage and control of filler metals.
 - 11.6 Explain filler metal traceability requirements and how to use applicable code requirements.

12.0 SHIELDED METAL ARC WELDING (SMAW) – ELECTRODES AND SELECTION

- Identify and explain methods, complications, preventative measures, and techniques that apply to bead and fillet welds.
 - 12.1 Identify steps to set up SMAW equipment.
 - 12.2 Describe method of striking and extinguishing an arc.
 - 12.3 Describe caused of arc blow and wander.
 - 12.4 Perform stringer, weave, and overlapping beads.
 - 12.5 Perform fillet welds in the 2F, 3F, and 4F Positions.

13.0 SHIELDED METAL ARC WELDING (SMAW) – BEADS AND FILLET WELDS

- Explain and practice methods and positions for groove welds with backing.
 - 13.1 Identify and explain groove welds.
 - 13.2 Identify the steps to set up shielded metal arc welding (SMAW) equipment for making V-groove welds.
 - 13.3 Perform SMAW for V-groove welds with backing in the 1G, 2G, 3G, and 4G positions.

CONTENT STANDARDS CONTINUED...

14.0 SHIELDED METAL ARC WELDING (SMAW) – GROOVE WELDS WITH BACKING

- Identify procedures to prepare and perform open v-groove welds.
 - 14.1 Identify the steps to prepare SMAW equipment for open-root V-groove welds.
 - 14.2 Identify the steps and perform open-root V-groove welds in G1, G2, G3, and 4G positions.
-

15.0 GAS METAL ARC WELDING (GMAW) – EQUIPMENT AND FILLER METALS

- Explain the equipment and filler metals that apply to gas metal arc welding.
 - 15.1 Explain GMAW safety.
 - 15.2 Explain the characteristics of welding current and power sources.
 - 15.3 Identify and explain the use of GMAW equipment.
 - 15.4 Identify and explain the use of GMAW shielding gases and filler metals.
 - 15.5 Identify the steps to set up GMAW equipment and identify tools for weld cleaning.
-

16.0 GAS METAL ARC WELDING (GMAW) – PLATE

- Identify and explain the equipment and weld types that apply to gas metal arc welding.
 - 16.1 Identify and explain GMAW equipment set up.
 - 16.2 Identify and demonstrate bead types.
 - 16.3 Identify and explain fillet welds.
 - 16.4 Identify and explain open-root V-groove welds.
-

17.0 FLUX CORE AND/OR METAL CORE WIRE (FCAW) – EQUIPMENT AND FILLER METALS

- Explain the equipment and filler metals that apply to flux cored arc welding.
 - 17.1 Explain FCAW safety.
 - 17.2 Explain the characteristics of welding current and power sources.
 - 17.3 Identify and explain the use of FCAW equipment.
 - 17.4 Identify and explain the use of FCAW shielding gases and filler metals.
 - 17.5 Identify the steps to set up FCAW equipment and identify tools for weld cleaning.
-

18.0 FLUX CORE AND/OR METAL CORE WIRE (FCAW) – PLATE

- Identify and explain the equipment and weld types that apply to flux cored arc welding.
 - 18.1 Identify and explain FCAW equipment set up.
 - 18.2 Identify and demonstrate bead types.
 - 18.3 Identify and explain fillet welds.
 - 18.4 Identify and explain open-root V-groove welds.
-

19.0 GAS TUNGSTEN ARC WELDING (GTAW) – EQUIPMENT AND FILLER MATERIALS

- Explain the equipment and filler materials that apply to gas tungsten arc welding.
 - 19.1 Explain GTAW safety.
 - 19.2 Identify and explain the use of GTAW equipment.
 - 19.3 Identify and explain the use of GTAW filler metals.
 - 19.4 Identify steps to set up GTAW equipment.
-

20.0 GAS TUNGSTEN ARC WELDING (GTAW) – PLATE

- Identify and explain the equipment and weld types that apply to gas tungsten arc welding.
 - 20.1 Identify and explain the use of GTAW techniques.
 - 20.2 Identify and explain bead types.
 - 20.3 Identify and explain groove and open V-groove welds.
-

CONTENT STANDARDS CONTINUED...

21.0 GAS TUNGSTUN ARC WELDING (GTAW) – ALUMINUM PLATE

- Identify and explain the equipment, characteristics, and weld types that apply to gas tungsten arc welding when using aluminum.
 - 21.1 Identify and explain aluminum metallurgy.
 - 21.2 Explain and identify characteristics of aluminum.
 - 21.3 Explain GTAW and set up equipment to weld aluminum plate.
 - 21.4 Explain and practice GTAW techniques for plate, including padding in the flat position with stringer beads, using aluminum filler metal.
 - 21.5 Make fillet welds on aluminum plate in 1F, 2F, 3F, and 4F positions.
 - 21.6 Make multi-pass open V-groove welds with backing on aluminum plate in the 1G, 2G, 3G, and 4G positions.
-

22.0 SHIELDED METAL ARC WELDING (SMAW) – OPEN-ROOT PIPE WELDS

- Identify procedures and techniques that apply to open-root pipe welds.
 - 22.1 Identify and explain how to prepare arc welding equipment for open-root pipe welds.
 - 22.2 Identify and explain open-root V-groove pipe welds.
-

23.0 SHIELDED METAL ARC WELDING (SMAW) – STAINLESS STEEL GROOVE AND PIPE WELDS

- Explain the preparation, processes, and positions of stainless steel groove pipe welds.
 - 23.1 Identify and explain stainless steel metallurgy.
 - 23.2 Identify and explain the selection of electrodes for welding stainless steel.
 - 23.3 Identify and explain welding variation for stainless steel.
 - 23.4 Identify the steps to prepare arc welding equipment for stainless steel welds.
 - 23.5 Explain stainless steel open-root V-groove welds.
 - 23.6 Demonstrate SMAW on stainless steel open-root V-groove joints in 1G, 2G, 3G, and 4G positions.
 - 23.7 Explain stainless steel open-root V-groove pipe welds.
 - 23.8 Demonstrate SMAW on stainless steel open-root V-groove pipe welds in 1G-ROTATED, 2G, 5G, and 6G positions.
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24.0 FABRICATION

- Identify and practice basic fabrication skills.
 - 24.1 Identify basic concepts of fabrication.
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25.0 METALLURGY

- Recognize and use principles of metallurgy.
 - 25.1 Identify basic concepts of metallurgy.
-



Standard 1: Welding Safety – Identify general safety considerations that apply to welding.

Topic 1: Identify some common hazards in welding.

Student Competencies

Core

- 1.1.1 Identify personal factors that cause accidents on a job-site.
- 1.1.2 Identify physical factors that cause accidents on a job-site.
- 1.1.3 Demonstrate correct use of fire extinguishers.
- 1.1.4 Identify classes of fire extinguishers (A, B, C, & D).
- 1.1.5 Identify and demonstrate use of fire blankets.
- 1.1.6 Adhere to safety label directions.
- 1.1.7 Apply specific information found in manuals, charts, and books.
- 1.1.8 Apply appropriate math to solve welding problems; whole numbers, fractions, decimals, and geometry.
- 1.1.9 Express length, area, volume in the metric system.

Keys to Employability

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
- 5. Speaking→ Organizes ideas and communicates orally.

Standard 1: Welding Safety – Identify general safety considerations that apply to welding.

Topic 2: Explain and identify proper personal protection used in welding.

Student Competencies

Core

- 1.2.1 Describe welding conditions that require body, foot, hand, ear, eye, face, and head protection.
- 1.2.2 Identify and use appropriate body protection.
- 1.2.3 Identify and use appropriate foot protection.
- 1.2.4 Identify and use appropriate hand protection.
- 1.2.5 Identify and use appropriate ear protection.
- 1.2.6 Identify and use appropriate eye, face, and head protection.

Keys to Employability

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Standard 1: Welding Safety – Identify general safety considerations that apply to welding.

Topic 3: Analyze ways to avoid welding fumes.

Student Competencies

Core

- 1.3.1 Identify the respiratory hazards of working with metals.
- 1.3.2 Emphasize the harmful effects of exposure to fumes and gases.
- 1.3.3 Discuss symptoms of overexposure.
- 1.3.4 Identify respiratory protection programs.

Advanced

- 1.3.5 Review the contents of ANSI Z49.1-1999 regarding ventilation.
- 1.3.6 Discuss the procedures that must be followed when selecting a respirator.
- 1.3.7 Explain how to inspect, clean, maintain, and store respirators.
- 1.3.8 Discuss the OSHA requirements for respirator protection programs to fumes and gases.

Keys to Employability

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Standard 1: Welding Safety – Identify general safety considerations that apply to welding.

Topic 4: Identify causes of accidents and preventative methods.

Student Competencies

Core

- 1.4.1 Define confined spaces.
- 1.4.2 Emphasize the importance of proper ventilation when welding in confined space.
- 1.4.3 Emphasize that simple cleaning and housekeeping contribute greatly to area safety.
- 1.4.4 Define hot work permits and fire watches.
- 1.4.5 Identify factors requiring a hot work permit and fire watches.
- 1.4.6 Review the basic safety procedures specific to oxyfuel gas welding.
- 1.4.7 Identify hazards of cutting containers.

Advanced

- 1.4.8 Review the contents of OSHA 29 CFR 1910.146.
- 1.4.9 Identify factors requiring a confined space permit

Keys to Employability

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Standard 1: Welding Safety – Identify general safety considerations that apply to welding.

Topic 5: Demonstrate safety techniques for storing and handling cylinders.

Student Competencies

Core

- 1.5.1 Identify the requirements for safe storage and handling of cylinders
- 1.5.2 Identify the requirements for locating, securing, and identifying cylinder storage.
- 1.5.3 Discuss precautions and procedures specific to valve protection caps.
- 1.5.4 Review the general precautions for working with cylinders.
- 1.5.5 Review the basic safety procedures specific to power tools.
- 1.5.6 Discuss the procedures and precautions for working with electricity and arc-welding equipment.

Keys to Employability

Resources

1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Standard 1: Welding Safety – Identify general safety considerations that apply to welding.

Topic 6: Identify and explain uses for material safety data sheets.

Student Competencies

Core

- 1.6.1 Discuss the purpose of and information available on a material safety data sheet (MSDS).

Keys to Employability

Personal Qualities

1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
5. Integrity/Honesty→ Chooses ethical courses of action.

Standard 1: Welding Safety – Identify general safety considerations that apply to welding.

Topic 7: Explain how to avoid electric shock when welding.

Student Competencies

Core

1.7.1 Review guidelines for avoiding electric shock.

Keys to Employability

Information

1. Acquires and Evaluates Information.
2. Organizes and Maintains Information.
3. Interprets and Communicates Information.
4. Uses Computers to Process Information.

Standard 1: Welding Safety – Identify general safety considerations that apply to welding.

Topic 8: Demonstrate proper material handling methods.

Student Competencies

Core

- 1.8.1 Explain procedures and precautions for lifting heavy objects.
- 1.8.2 Identify and discuss the elements of an emergency action plan.
- 1.8.3 Explain the proper use of hoists and cranes for lifting.

Advanced

1.8.4 Use hoists and cranes for lifting.

Keys to Employability

Technology

1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.



Standard 1: Welding Safety – Identify general safety considerations that apply to welding.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 1: Welding Safety – Identify general safety considerations that apply to welding.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest

Mathematics cont.

- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.1. Construct appropriate displays of given data
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.3. Identify the variable, sample, and population in a well-designed study
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.6. Calculate probabilities of compound events using addition and multiplication rules
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.3. Use approximations to compare the standard and metric systems of measurement
- 9-10.4.4. Given a conversion factor, convert between standard and metric measurements
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.8. Given a formula list, compute the area of a regular polygon
- 9-10.4.9. Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.4. Perform the operations of addition, subtraction, multiplication, and division on algebraic functions
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions
- 11-12.5.6. Determine and write an equation for a function that models a mathematical relationship

Standard 1: Welding Safety – Identify general safety considerations that apply to welding.

Academic Cross Walk

Science

- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.5. Design and conduct a guided investigation
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic and behaviors
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.5.5. Know the effects of human activities on the environment
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem

Science cont.

- 11-12.6.3 Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid



Standard 1: Welding Safety – Identify general safety considerations that apply to welding.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy



Standard 2: Welding Symbols – Recognize welding symbols and interpret meaning.

Topic 1: Identify and explain the various parts of a welding symbol.

Student Competencies

Core

- 2.1.1 Identify and explain symbols for welds.
- 2.1.2 Identify and explain the location of weld symbols.
- 2.1.3 Identify and explain how to combine weld symbols.
- 2.1.4 Identify and explain the sizing and dimensioning of welds.

Keys to Employability

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
- 5. Speaking→ Organizes ideas and communicates orally.

Standard 2: Welding Symbols – Recognize welding symbols and interpret meaning.

Topic 2: Identify and explain fillet and groove weld symbols.

Student Competencies

Core

- 2.2.1 Identify and explain how to size fillet welds.
- 2.2.2 Identify and explain sizing groove welds.
- 2.2.3 Identify and explain dimensioning groove welds.
- 2.2.4 Identify and explain sizing and dimensioning plug welds.
- 2.2.5 Identify and explain sizing and dimensioning slot welds.
- 2.2.6 Identify and explain multiple reference lines.

Keys to Employability

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Information

- 1. Acquires and Evaluates Information.
- 2. Organizes and Maintains Information.
- 3. Interprets and Communicates Information.
- 4. Uses Computers to Process Information.

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Technology

- 1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
- 2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
- 3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Standard 2: Welding Symbols – Recognize welding symbols and interpret meaning.

Topic 3: Analyze welding symbols on drawings, specifications, and welding procedure specifications (WPSs).

Student Competencies

Core

- 2.3.1 Identify and explain weld-all-around.
- 2.3.2 Identify and explain field weld.
- 2.3.3 Identify and explain contour finish.

Keys to Employability

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Standard 2: Welding Symbols – Recognize welding symbols and interpret meaning.

Topic 4: Interpret welding symbols from print.

Student Competencies

Advanced

- 2.4.1 Identify and explain backing and spacer symbols.
- 2.4.2 Identify and explain back or backing weld symbol.
- 2.4.3 Identify and explain melt-through symbols.
- 2.4.4 Identify and explain surfacing weld symbols.
- 2.4.5 Identify and explain edge weld symbols.
- 2.4.6 Identify and explain spot weld symbols.
- 2.4.7 Identify and explain seam weld symbols.

Keys to Employability

Personal Qualities

- 1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
- 2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
- 3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
- 4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control
- 5. Integrity/Honesty→ Chooses ethical courses of action.



Standard 2: Welding Symbols – Recognize welding symbols and interpret meaning.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 10.1.9. Develop an outline
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.1. Summarize information from nonfiction genres
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details

English Language Arts cont.

- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose
- 10.3.7. Use a variety of supporting details
- 10.3.8. Use language appropriate to the format of the composition
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.3. Elaborate ideas through word choice and description using grade-level vocabulary
- 11.3.5. Use a variety of supporting details
- 12.3.5. Elaborate ideas through word choice and description using grade-level vocabulary
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media
- 9.6.6. Interpret symbolism

Standard 2: Welding Symbols – Recognize welding symbols and interpret meaning.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, and dilations) and coordinates (translations, reflections, and dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.1. Construct appropriate displays of given data
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.3. Identify the variable, sample, and population in a well-designed study

Mathematics cont.

- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.6. Calculate probabilities of compound events using addition and multiplication rules
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.3. Use approximations to compare the standard and metric systems of measurement
- 9-10.4.4. Given a conversion factor, convert between standard and metric measurements
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.9. Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.4. Perform the operations of addition, subtraction, multiplication, and division on algebraic functions
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations (i.e., reflection, translation, dilation) to graph linear, quadratic, and absolute value functions
- 11-12.5.6. Determine and write an equation for a function that models a mathematical relationship

Standard 2: Welding Symbols – Recognize welding symbols and interpret meaning.

Academic Cross Walk

Science

- 9-10.1.3. Understand the relationship between form and function (e.g., bonding, aerodynamics, cell specialization, and plate tectonics)
- 11-12.1.3. Understand the relationship between form and function (e.g., atoms and ions, aerodynamics, cell specialization, and plate tectonics)
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations (e.g., goggles, apron, eye wash station)
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies (e.g., interpolation, and extrapolation of data, significant figures, dimensional analysis)
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria (e.g., a proposed explanation must be logically consistent, be open to questions on possible modifications, be based on historical and current scientific knowledge)
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem (e.g., computer-assisted tools, Internet, research skills)

Science cont.

- 9-10.6.2. Know how scientific principles have been used to create common technologies (e.g., household appliances, automotive parts, agricultural equipment, textiles, fabrics, computers, Internet resources, CDROMs)
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem (e.g., computer-assisted tools, Internet, research skills, CBL, graphing calculators)
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment

Standard 2: Welding Symbols – Recognize welding symbols and interpret meaning.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy

Standard 3: Reading Welding Detail Drawings – Identify, interpret, and practice reading welding detail drawings.

Topic 1: Identify and explain a welding detail drawing.

Student Competencies

Core

- 3.1.1 Identify and explain lines.
- 3.1.2 Identify and explain material symbols.

Keys to Employability

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Standard 3: Reading Welding Detail Drawings – Identify, interpret, and practice reading welding detail drawings.

Topic 2: Identify and explain lines, material fills, and sections.

Student Competencies

Core

- 3.2.1 Identify and explain lines.
- 3.2.2 Identify and explain material symbols.
- 3.2.3 Identify and explain revolved sections.

Advanced

- 3.2.4 Identify and explain solid round, pipe, or tubing breaks.

Keys to Employability

Information

- 1. Acquires and Evaluates Information.
- 2. Organizes and Maintains Information.
- 3. Interprets and Communicates Information.
- 4. Uses Computers to Process Information.

Technology

- 1. Selects Technology → Chooses procedures, tools, or equipment including computers and related technologies.
- 2. Applies Technology to Task → Understands overall intent and proper procedures for setup and operation of equipment.
- 3. Maintains and Troubleshoots Equipment → Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Standard 3: Reading Welding Detail Drawings – Identify, interpret, and practice reading welding detail drawings.

Topic 3: Identify and explain object views.

Student Competencies

Core

- 3.3.1 Identify and explain isometric views.
- 3.3.2 Identify and explain multiviews.
- 3.3.3 Identify and explain sections.

Keys to Employability

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills.
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Standard 3: Reading Welding Detail Drawings – Identify, interpret, and practice reading welding detail drawings.

Topic 4: Identify and explain dimensioning.

Student Competencies

Core

- 3.4.1 Identify and explain scale.
- 3.4.2 Identify and explain size and location dimensions.
- 3.4.3 Identify and explain hole dimensions.
- 3.4.4 Identify and explain angle, chamfer, and bevel dimensions.

Advanced

- 3.4.5 Identify and explain radius and arc dimensions.
- 3.4.6 Identify and explain tolerances.

Keys to Employability

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
- 5. Speaking→ Organizes ideas and communicates orally.

Standard 3: Reading Welding Detail Drawings – Identify, interpret, and practice reading welding detail drawings.

Topic 5: Develop basic welding drawings.

Student Competencies

Core

- 3.5.1 Construct basic elements of a welding detail drawing.

Keys to Employability

Personal Qualities

1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control
5. Integrity/Honesty→ Chooses ethical courses of action.

Standard 3: Reading Welding Detail Drawings – Identify, interpret, and practice reading welding detail drawings.

Topic 6: Identify and explain notes and bill of materials.

Student Competencies

Core

- 3.6.1 Identify and explain note.
3.6.2 Identify and explain bill of materials.

Keys to Employability

Thinking Skills

1. Creative Thinking→ Generates new ideas.
2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
3. Problem Solving→ Recognizes problems and devises and implements plan of action.
4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Standard 3: Reading Welding Detail Drawings – Identify, interpret, and practice reading welding detail drawings.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 10.1.9. Develop an outline
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.1. Summarize information from nonfiction genres
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details

English Language Arts cont.

- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose
- 10.3.7. Use a variety of supporting details
- 10.3.8. Use language appropriate to the format of the composition
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.3. Elaborate ideas through word choice and description using grade-level vocabulary
- 11.3.5. Use a variety of supporting details
- 12.3.5. Elaborate ideas through word choice and description using grade-level vocabulary
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media
- 9.6.6. Interpret symbolism

Standard 3: Reading Welding Detail Drawings – Identify, interpret, and practice reading welding detail drawings.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, and dilations) and coordinates (translations, reflections, and dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.1. Construct appropriate displays of given data
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.3. Identify the variable, sample, and population in a well-designed study

Mathematics cont.

- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.6. Calculate probabilities of compound events using addition and multiplication rules
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.3. Use approximations to compare the standard and metric systems of measurement
- 9-10.4.4. Given a conversion factor, convert between standard and metric measurements
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.8. Given a formula list, compute the area of a regular polygon
- 9-10.4.9. Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.4. Perform the operations of addition, subtraction, multiplication, and division on algebraic functions
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations (i.e., reflection, translation, dilation) to graph linear, quadratic, and absolute value functions
- 11-12.5.6. Determine and write an equation for a function that models a mathematical relationship

Standard 3: Reading Welding Detail Drawings – Identify, interpret, and practice reading welding detail drawings.

Academic Cross Walk

Science

- 9-10.1.3. Understand the relationship between form and function (e.g., bonding, aerodynamics, cell specialization, and plate tectonics)
- 11-12.1.3. Understand the relationship between form and function (e.g., atoms and ions, aerodynamics, cell specialization, and plate tectonics)
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations (e.g., goggles, apron, eye wash station)
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies (e.g., interpolation, and extrapolation of data, significant figures, dimensional analysis)
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria (e.g., a proposed explanation must be logically consistent, be open to questions on possible modifications, be based on historical and current scientific knowledge)
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem (e.g., computer-assisted tools, Internet, research skills)

Science cont.

- 9-10.6.2. Know how scientific principles have been used to create common technologies (e.g., household appliances, automotive parts, agricultural equipment, textiles, fabrics, computers, Internet resources, CDROMs)
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem (e.g., computer-assisted tools, Internet, research skills, CBL, graphing calculators)
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment

Standard 3: Reading Welding Detail Drawings – Identify, interpret, and practice reading welding detail drawings.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy

Standard 4: Base Metal Preparation – Analyze general information, procedures, and techniques that apply to base metal preparation.

Topic 1: Clean base metal for welding or cutting.

Student Competencies

Core

- 4.1.1 Explain why base metals must be cleaned before welding.
- 4.1.2 Identify types of surface corrosion.
- 4.1.3 Identify defects caused by surface contamination.
- 4.1.4 Discuss proper power tool procedures.
- 4.1.5 Discuss tools and methods used for mechanical cleaning.

Keys to Employability

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
- 5. Speaking→ Organizes ideas and communicates orally.

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Standard 4: Base Metal Preparation – Analyze general information, procedures, and techniques that apply to base metal preparation.

Topic 2: Identify and explain joint design.

Student Competencies

Core

- 4.2.1 Identify the factors considered when selecting joints.
- 4.2.2 Explain the applications for plug and slot welds.
- 4.2.3 Discuss preheating surfaces for SMAW.
- 4.2.4 Identify applications for fillet welds.
- 4.2.5 Identify applications for square-groove welds, bevel-groove welds, and V-groove welds.
- 4.2.6 Identify applications for J- and U-groove welds.
- 4.2.7 Identify applications for combination groove and fillet welds.
- 4.2.8 Explain distortion and discuss its causes.
- 4.2.9 Discuss the purpose of the groove angle and explain the purpose of increasing or decreasing the root preparation.
- 4.2.10 Describe problems caused by groove angles that are smaller or larger than required.
- 4.2.11 Identify types of backing for plate.
- 4.2.12 Discuss joint preparation using gas, metal backing, or tape.
- 4.2.13 Identify backing strip information in welding procedure specifications.
- 4.2.14 Discuss the significance of welding position and considerations for out-of-position welding.

Advanced

- 4.2.15 Discuss the stresses caused by loads on joints.
- 4.2.16 Explain the purpose and significance of welding codes.

Keys to Employability

Personal Qualities

1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
5. Integrity/Honesty→ Chooses ethical courses of action.

Resources

1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Information

1. Acquires and Evaluates Information.
2. Organizes and Maintains Information.
3. Interprets and Communicates Information.
4. Uses Computers to Process Information.

Standard 4: Base Metal Preparation – Analyze general information, procedures, and techniques that apply to base metal preparation.

Topic 3: Introduce joint preparation methods and explain how to identify joint specifications.

Student Competencies

Core

- 4.3.1 Identify the mechanical preparation necessary for heat-sensitive materials.
- 4.3.2 Emphasize the dangers of using improper grinding wheels.
- 4.3.3 Explain the importance of manufacturer's guidelines for equipment such as grinders.
- 4.3.4 Discuss the use of grinders and pipe-beveling machines.
- 4.3.5 Discuss the use of nibblers and cutters.

Advanced

- 4.3.6 Discuss applications for thermal joint preparation.
- 4.3.7 Discuss the problems caused by the presence of slag and carbon deposits during thermal joint preparation.

Keys to Employability

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Technology

- 1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
- 2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
- 3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.



Standard 4: Base Metal Preparation – Analyze general information, procedures, and techniques that apply to base metal preparation.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 4: Base Metal Preparation – Analyze general information, procedures, and techniques that apply to base metal preparation.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, and dilations) and coordinates (translations, reflections, and dilations)

Mathematics cont.

- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.9. Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.4. Perform the operations of addition, subtraction, multiplication, and division on algebraic functions
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations (i.e., reflection, translation, dilation) to graph linear, quadratic, and absolute value functions
- 11-12.5.6. Determine and write an equation for a function that models a mathematical relationship

Standard 4: Base Metal Preparation – Analyze general information, procedures, and techniques that apply to base metal preparation.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem

Science cont.

- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid



Standard 4: Base Metal Preparation – Analyze general information, procedures, and techniques that apply to base metal preparation.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy



Standard 5: Joint Fit-Up and Alignment – Examine codes, procedures, and uses for joint fit-up and alignment.

Topic 1: Identify and explain job code specifications.

Student Competencies

Core

- 5.1.1 Explain how joint design and setup affects the safety and quality of a weldment.
- 5.1.2 Explain how straightedges, squares, and levels are used to check joint fit-up and alignment.

Advanced

- 5.1.3 Identify specifications, codes, and standards that govern welding.
- 5.1.4 Identify the information contained in a WPS (weld procedure specification).
- 5.1.5 Explain that all welding must be done in accordance with industry standards, but not all welds require a WPS.
- 5.1.6 Discuss the periodic revisions made to codes governing welding.
- 5.1.7 Explain the difference between essential and nonessential variables.

Keys to Employability

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Standard 5: Joint Fit-Up and Alignment – Examine codes, procedures, and uses for joint fit-up and alignment.

Topic 2: Explain the uses of fit-up gauges and measuring devices to check joint fit-up.

Student Competencies

Advanced

- 5.2.1 Explain how Hi-Lo gauges are used to check joint fit-up and alignment.
- 5.2.2 Explain why two readings should be taken when checking for internal misalignment.

Keys to Employability

Technology

- 1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
- 2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
- 3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Standard 5: Joint Fit-Up and Alignment – Examine codes, procedures, and uses for joint fit-up and alignment.

Topic 3: Identify and explain how to fit up joints using plate and pipe fit-up tools.

Student Competencies

Advanced

- 5.3.1 Demonstrate how hydraulic jacks, chain falls, and come-alongs are used to position parts of a weldment.
- 5.3.2 Explain the dangers of current passing through hydraulic jacks, chain hoists, and come-alongs.
- 5.3.3 Discuss the safe use of hydraulic jacks, chain hoists, and come-alongs.
- 5.3.4 Explain that the most common method of holding a joint in place is to tack weld it.
- 5.3.5 Discuss field-fabrication of strongbacks.
- 5.3.6 Demonstrate how clips, yokes, and wedges are used on the job site.
- 5.3.7 Demonstrate how yokes, wedges, and bolts are used with strongbacks.
- 5.3.8 Demonstrate how plate alignment tools are used.
- 5.3.9 Describe the manufacture, care, and storage of fabricated alignment tools.
- 5.3.10 Discuss the uses of pipe jacks and rollers.
- 5.3.11 Discuss the conditions in which nonferrous alignments tools must be used.
- 5.3.12 Emphasize that jack stands and rollers must never be field-fabricated.
- 5.3.13 Identify the types of chain clamps that provide precise fit and alignment.
- 5.3.14 Explain that cage clamps align and clamp pipe of one size.
- 5.3.15 Point out that the rim clamp is a non-chain design.
- 5.3.16 Identify clamping devices for small-diameter pipes.
- 5.3.17 Explain the purpose of pipe pullers.
- 5.3.18 Explain why joints should not be forced into alignment.
- 5.3.19 Explain how flange alignment tools are used.

Keys to Employability

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
- 5. Speaking→ Organizes ideas and communicates orally.

Personal Qualities

- 1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
- 2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
- 3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
- 4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
- 5. Integrity/Honesty→ Chooses ethical courses of action.

Standard 5: Joint Fit-Up and Alignment – Examine codes, procedures, and uses for joint fit-up and alignment.

Topic 4: Identify and explain distortion and how it is controlled.

Student Competencies

Core

- 5.4.1 Discuss that distortion cannot be prevented but can be controlled.
- 5.4.2 Discuss causes of distortion and define residual stress.

Advanced

- 5.4.3 Explain how distortion is related to the coefficient of thermal expansion and to the specific heat per unit volume.
- 5.4.4 Discuss thermal expansion and specific heat per unit volume in common metals.
- 5.4.5 Explain the effects of residual stress after clamps are removed from a weldment.
- 5.4.6 List techniques and tools for controlling distortion.
- 5.4.7 Explain how clamping, bracing, and tack welding are used to control distortion.
- 5.4.8 Emphasize the need to follow the site WPS.
- 5.4.9 Explain how to control distortion through weld sizing, fit-up, and edge preparation.
- 5.4.10 Point out that double V-grooves should be used in place of single V-grooves when possible.
- 5.4.11 Describe penetration and explain the use of backing strips to control it.
- 5.4.12 Explain how depth of penetration is controlled inside pipe using gas backing.
- 5.4.13 Explain the need for vent holes when using gas backing.
- 5.4.14 Point out that the joint penetration for backing rings is similar to the preparation for open root joints.
- 5.4.15 Explain that consumable inserts become part of the finished weld and must match the filler metal requirements.
- 5.4.16 Explain that all common fittings are available as socket fittings.
- 5.4.17 Point out that the end of the pipe must not touch the bottom of the socket.
- 5.4.18 Explain the applications for intermittent welding.
- 5.4.19 Explain that backstep welding controls distortion by minimizing and interrupting heat input.
- 5.4.20 Explain how welding sequences and buddy welding control distortion.
- 5.4.21 Explain the purpose of staggering welds on long runs.
- 5.4.22 List the items to be checked periodically during welding.

Keys to Employability

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Standard 5: Joint Fit-Up and Alignment – Examine codes, procedures, and uses for joint fit-up and alignment.

Topic 5: Identify the steps to check for joint misalignment and poor fit-up before and after welding.

Student Competencies

Core

5.5.1 Explain how to check joint alignment and fit-up.

Advanced

5.5.2 Demonstrate to students how to fit up joints using plate and pipe fit-up tools.

5.5.3 Demonstrate to students how to check joints for proper fit-up and alignment before and after welding.

Keys to Employability

Resources

1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Information

1. Acquires and Evaluates Information.
2. Organizes and Maintains Information.
3. Interprets and Communicates Information.
4. Uses Computers to Process Information.

Standard 5: Joint Fit-Up and Alignment – Examine codes, procedures, and uses for joint fit-up and alignment.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 5: Joint Fit-Up and Alignment – Examine codes, procedures, and uses for joint fit-up and alignment.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, and dilations) and coordinates (translations, reflections, and dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.1. Construct appropriate displays of given data
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.3. Identify the variable, sample, and population in a well-designed study

Mathematics cont.

- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.6. Calculate probabilities of compound events using addition and multiplication rules
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.3. Use approximations to compare the standard and metric systems of measurement
- 9-10.4.4. Given a conversion factor, convert between standard and metric measurements
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.8. Given a formula list, compute the area of a regular polygon
- 9-10.4.9. Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.4. Perform the operations of addition, subtraction, multiplication, and division on algebraic functions
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations (i.e., reflection, translation, dilation) to graph linear, quadratic, and absolute value functions
- 11-12.5.6. Determine and write an equation for a function that models a mathematical relationship

Standard 5: Joint Fit-Up and Alignment – Examine codes, procedures, and uses for joint fit-up and alignment.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 9-10.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.5. Understand principles governing evolution and equilibrium within systems
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors

Science cont.

- 9-10.3.1. Classify elements according to similar properties.
- 9-10.3.4. Construct a model of an atom
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid

Standard 5: Joint Fit-Up and Alignment – Examine codes, procedures, and uses for joint fit-up and alignment.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy

Standard 6: Weld Quality – Examine codes, conditions, and practices that apply to weld quality and analyses.

Topic 1: Identify and explain codes governing welding.

Student Competencies

Core

- 6.1.1 Identify the codes governing welding and point out that the failure of a weld could have serious consequences.
- 6.1.2 List the components of a welding procedure specification.

Advanced

- 6.1.3 Discuss welding codes published by ASME and AWS.
- 6.1.4 Discuss welding standards published by API.
- 6.1.5 Explain the function of ANSI.
- 6.1.6 List the three basic elements of welding codes.
- 6.1.7 Compare and contrast essential and nonessential variables.

Keys to Employability

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
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- 5. Integrity/Honesty→ Chooses ethical courses of action

Standard 6: Weld Quality – Examine codes, conditions, and practices that apply to weld quality and analyses.

Topic 2: Identify and explain weld imperfections and their causes.

Student Competencies

Core

- 6.2.1 Define discontinuities and list the most common ones.
- 6.2.2 Discuss the procedures that minimize porosity.
- 6.2.3 Define inclusions and discuss their causes.
- 6.2.4 Define cracks and identify the three basic types that occur in weld metal.
- 6.2.5 Define base metal cracking and identify basic types.
- 6.2.6 Explain how incomplete joint penetration occurs and discuss its prevention.
- 6.2.7 Compare and contrast incomplete fusion and incomplete joint penetration.
- 6.2.8 Identify the causes of incomplete fusion.
- 6.2.9 Define undercut and discuss its causes.
- 6.2.10 Discuss the undesirable effects of arc strikes.
- 6.2.11 Describe the causes of spatter.
- 6.2.12 Discuss the effects of weld profiles on joint performance.

Advanced

- 6.2.13 Identify the major types of porosity.
- 6.2.14 Explain the difference between hot and cold cracks.

Keys to Employability

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Standard 6: Weld Quality – Examine codes, conditions, and practices that apply to weld quality and analyses.

Topic 3: Identify and explain nondestructive examination practices.

Student Competencies

Advanced

- 6.3.1 List basic NDE practices.
- 6.3.2 Explain the procedures used in visual inspection.
- 6.3.3 Compare and contrast undercut gauges, butt weld reinforcement gauges, and fillet weld blade gauge sets.
- 6.3.4 Explain the procedures used in liquid penetrant inspection.
- 6.3.5 Discuss the advantages and disadvantages of liquid penetrant inspection.
- 6.3.6 Explain the procedures used in magnetic particle inspection.
- 6.3.7 Discuss the advantages and disadvantages of magnetic particle inspection.
- 6.3.8 Explain the procedures used in radiographic inspection.
- 6.3.9 Discuss the advantages and disadvantages of radiographic inspection.
- 6.3.10 Explain the procedures used in ultrasonic inspection.
- 6.3.11 Discuss the advantages and disadvantages of ultrasonic inspection.
- 6.3.12 Explain the procedures used in electromagnetic inspection.
- 6.3.13 Summarize the purpose of and procedures used in leak testing.

Keys to Employability

Interpersonal

- 1. Participates as a Member of a Team → Contributes to group effort.
- 2. Teaches Others New Skills
- 3. Serves Clients/Customers → Works to satisfy customers' expectations.
- 4. Exercises Leadership → Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates → Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity → Works well with men and women from diverse backgrounds.

Standard 6: Weld Quality – Examine codes, conditions, and practices that apply to weld quality and analyses.

Topic 4: Identify common destructive testing methods.

Student Competencies

Core

6.4.1 Explain why destructive tests are used.

Advanced

6.4.2 Define common destructive tests.

Keys to Employability

Information

1. Acquires and Evaluates Information.
2. Organizes and Maintains Information.
3. Interprets and Communicates Information.
4. Uses Computers to Process Information.

Standard 6: Weld Quality – Examine codes, conditions, and practices that apply to weld quality and analyses.

Topic 5: Identify and explain welder qualification tests.

Student Competencies

Advanced

- 6.5.1 Discuss the purpose of welder performance qualification tests.
- 6.5.2 Explain the designations for welding positions.
- 6.5.3 Describe the qualification information contained in the AWS structural steel code.
- 6.5.4 Discuss electrode classification.
- 6.5.5 Explain the significance of Section IX of the ASME Boiler and Pressure Vessel Code.
- 6.5.6 Discuss how to avoid potential problems during qualification tests.
- 6.5.7 Describe typical specimen locations for qualification tests.
- 6.5.8 Describe inspection procedures used for qualification tests.
- 6.5.9 Discuss qualification retesting and requalification.

Keys to Employability

Technology

1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Standard 6: Weld Quality – Examine codes, conditions, and practices that apply to weld quality and analyses.

Topic 6: Explain the importance of quality workmanship.

Student Competencies

Core

- 6.6.1 Emphasize the importance of quality work.
- 6.6.2 Emphasize the need to understand the site organization.
- 6.6.3 Explain why the welder should follow the chain of command.

Keys to Employability

Systems

- 1. Understands Systems → Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance → Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems → Suggests modifications to existing systems and develops new or alternative systems to improve performance.



Standard 6: Weld Quality – Examine codes, conditions, and practices that apply to weld quality and analyses.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 6: Weld Quality – Examine codes, conditions, and practices that apply to weld quality and analyses.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, and dilations) and coordinates (translations, reflections, and dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives

Mathematics cont.

- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.3. Identify the variable, sample, and population in a well-designed study
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.6. Calculate probabilities of compound events using addition and multiplication rules
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.3. Use approximations to compare the standard and metric systems of measurement
- 9-10.4.4. Given a conversion factor, convert between standard and metric measurements
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.9. Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.4. Perform the operations of addition, subtraction, multiplication, and division on algebraic functions
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations (i.e., reflection, translation, dilation) to graph linear, quadratic, and absolute value functions
- 11-12.5.6. Determine and write an equation for a function that models a mathematical relationship

Standard 6: Weld Quality – Examine codes, conditions, and practices that apply to weld quality and analyses.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.6. Understand how scientists create and use models to address scientific knowledge
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 8.5.5. Know a variety of methods can be used to determine geological time

Science cont.

- 8.5.6. Understand the changes Earth has undergone over geologic time
- 9-10.5.5. Know the effects of human activities on the environment
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid

Standard 6: Weld Quality – Examine codes, conditions, and practices that apply to weld quality and analyses.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy

Standard 7: Oxyfuel Processes – Identify and explain equipment, equipment set up, and techniques that apply to oxyfuel processes.

Topic 1: Identify and explain the use of oxyfuel cutting equipment.

Student Competencies

Core

- 7.1.1 Explain the purpose and applications of oxyfuel cutting.
- 7.1.2 Review safety guidelines for working with oxyfuel equipment.
- 7.1.3 Discuss procedures for preventing fire and explosions.
- 7.1.4 Emphasize the need for proper ventilation.
- 7.1.5 Discuss the power contained in various explosive mixtures.
- 7.1.6 Summarize the equipment used for oxyfuel cutting.
- 7.1.7 Discuss the properties of oxygen and the use of oxygen cylinders.
- 7.1.8 Emphasize the danger of removing protective caps from cylinders that are not secured.
- 7.1.9 Discuss the properties of acetylene and the use of acetylene cylinders.
- 7.1.10 Discuss the flame temperatures of oxygen with various fuel gases.
- 7.1.11 Discuss the uses of and precautions associated with liquefied fuel gas cylinders.
- 7.1.12 Emphasize the danger of applying heat directly to a cylinder or regulator.
- 7.1.13 Explain the purpose and use of regulators.
- 7.1.14 Compare and contrast the two types of regulators.
- 7.1.15 Identify the guidelines for preventing injury to personnel and damage to regulators.
- 7.1.16 Discuss the purpose and uses of check valves and flashback arrestors.
- 7.1.17 Emphasize the proper use of torch wrenches.
- 7.1.18 Discuss the purpose and use of hoses.
- 7.1.19 Explain the applications for one-piece and combination cutting torches.
- 7.1.20 Compare and contrast the two types of oxyfuel cutting torches in general use.
- 7.1.21 Compare combination torches to one-piece hand cutting torches.
- 7.1.22 Discuss cutting torches, cutting torch tip sizes and styles, and gas pressures used with tips of different sizes.

Keys to Employability

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
- 5. Speaking→ Organizes ideas and communicates orally.

Standard 7: Oxyfuel Processes – Identify and explain equipment, equipment set up, and techniques that apply to oxyfuel processes.

Topic 1: Identify and explain the use of oxyfuel cutting equipment. (*Continued*)

Student Competencies

Core (*continued*)

- 7.1.23 Discuss the cutting tips used with liquefied fuel gases.
- 7.1.24 Identify the applications for special-purpose cutting tips.
- 7.1.25 Discuss the advantages of two-piece replacement torch tips.
- 7.1.26 Explain the purpose of tip cleaners and tip drills.
- 7.1.27 Emphasize that matches and gas-filled lighters must never be used to light torches.
- 7.1.28 Describe cylinder carts and explain their purposes.
- 7.1.29 Explain how to use a cup-type striker.
- 7.1.30 Demonstrate how to use a soapstone and how to sharpen it.
- 7.1.31 Describe the use of mechanical guides, motorized cutting machines, and oxygen lances.
- 7.1.32 Explain how to make long, circular, or irregular cuts using mechanical guides.
- 7.1.33 Discuss shop-made cutting guides.
- 7.1.34 Discuss the various motor-driven cutting machines available.

Advanced

- 7.1.35 Discuss the use of transducers in identifying tanks.
- 7.1.36 Explain the advantages of clamshell cylinder caps and ring guard cylinder caps
- 7.1.37 Compare and contrast computer-controlled gantry cutting machines, pattern-tracing machines, and track cutting machines.
- 7.1.38 Compare and contrast band track and hand-cranked ring gear cutters/bevellers.
- 7.1.39 Identify difficult materials for which exothermic oxygen lances are used.

Keys to Employability

Information

- 1. Acquires and Evaluates Information.
- 2. Organizes and Maintains Information.
- 3. Interprets and Communicates Information.
- 4. Uses Computers to Process Information.

Standard 7: Oxyfuel Processes – Identify and explain equipment, equipment set up, and techniques that apply to oxyfuel processes.

Topic 2: Identify the steps for set up of oxyfuel equipment.

Student Competencies

Core

- 7.2.1 Emphasize the need to handle cylinders carefully.
- 7.2.2 Discuss the ANSI requirements for separating fuel and oxygen cylinders.
- 7.2.3 Point out that an acetylene cylinder found on its side should be up-righted so the acetone can settle.
- 7.2.4 Identify appropriate methods to open valves.
- 7.2.5 Point out that cloths used to wipe valve seats must be free of oil and grease.
- 7.2.6 List the steps that must be followed to attach regulators.
- 7.2.7 List the steps that must be followed to install flashback arrestors and check valves.
- 7.2.8 Discuss the dangers of flashback.
- 7.2.9 Explain that new hoses contain material that can clog torch needle valves.
- 7.2.10 Emphasize the danger of blowing out hoses with compressed air, fuel, gas, or oxygen.
- 7.2.11 List the steps that must be followed to connect hoses to regulators and torches.
- 7.2.12 List the steps that must be followed to install attachments and cutting tips on torches.
- 7.2.13 Discuss the dangers associated with excessive acetylene flow rates.
- 7.2.14 List the steps that must be followed to close torch valves.
- 7.2.15 Discuss the importance of loosening regulator adjusting screws.
- 7.2.16 List the steps that must be followed to open cylinder valves.
- 7.2.17 List the steps that must be followed to purge torches and set working pressures.
- 7.2.18 Point out that static pressure must not rise to 15 psi if acetylene is used as a fuel gas.
- 7.2.19 Point out that T-wrenches should always be left in place.
- 7.2.20 Emphasize the importance of leak testing.
- 7.2.21 Identify procedures that help prevent flashback.

Keys to Employability

Personal Qualities

- 1. Responsibility → Exerts a high level of effort and perseveres towards goal attainment.
- 2. Self-Esteem → Believes in own self worth and maintains a positive view of self.
- 3. Sociability → Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
- 4. Self-Management → Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
- 5. Integrity/Honesty → Chooses ethical courses of action.

Standard 7: Oxyfuel Processes – Identify and explain equipment, equipment set up, and techniques that apply to oxyfuel processes.

Topic 2: Identify the steps for set up of oxyfuel equipment. (*Continued*)

Student Competencies

Core (*continued*)

- 7.2.22 Emphasize that detergent must not contain oil.
- 7.2.23 Discuss the harmful effects of over tightening connections.
- 7.2.24 Warn the students that explosive concentrations of gases may accumulate if equipment is not purged and leak-tested in a well-ventilated area.
- 7.2.25 Emphasize the need to leak test cutting and welding torches.

Advanced

- 7.2.26 Demonstrate how a cylinder should be hoisted with a lifting cage.

Keys to Employability

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Standard 7: Oxyfuel Processes – Identify and explain equipment, equipment set up, and techniques that apply to oxyfuel processes.

Topic 3: Identify the steps to light and adjust an oxyfuel torch.

Student Competencies

Core

- 7.3.1 Compare and contrast the three types of oxyfuel flames.
- 7.3.2 Define backfire and discuss possible causes.
- 7.3.3 List the steps that must be followed to ignite torches.
- 7.3.4 Identify manufacturer's charts for selecting tips and igniting torches.
- 7.3.5 Explain how to set maximum fuel flow for the tip size in use.
- 7.3.6 Emphasize proper handling and transportation of cylinders.
- 7.3.7 Point out that fuel gas and oxygen cylinders must never be stored together.

Keys to Employability

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Standard 7: Oxyfuel Processes – Identify and explain equipment, equipment set up, and techniques that apply to oxyfuel processes.

Topic 4: Identify the steps to shut down and disassemble oxyfuel cutting equipment.

Student Competencies

Core

- 7.4.1 Demonstrate how to shut down oxyfuel cutting equipment.
- 7.4.2 Demonstrate how to disassemble oxyfuel cutting equipment.
- 7.4.3 Point out that permanent markers should not be used on cylinders.
- 7.4.4 Demonstrate how to change empty cylinders.
- 7.4.5 Emphasize proper handling and transportation of cylinders.

Keys to Employability

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Standard 7: Oxyfuel Processes – Identify and explain equipment, equipment set up, and techniques that apply to oxyfuel processes.

Topic 5: Perform oxyfuel cutting, heating, and welding.

Student Competencies

Core

- 7.5.1 Summarize the cutting procedures.
- 7.5.2 Describe the features of good and bad cuts.
- 7.5.3 Discuss the causes of bad cuts.
- 7.5.4 Emphasize the importance of properly laying out and marking cuts.
- 7.5.5 Summarize the procedures for cutting thin and thick steel.
- 7.5.6 Emphasize the dangers of holding the tip upright when cutting thin steel.
- 7.5.7 Summarize the procedures for piercing a plate.
- 7.5.8 Summarize the procedures for cutting bevels.
- 7.5.9 Summarize the procedures for performing washing.
- 7.5.10 Summarize the procedures for performing gouging.
- 7.5.11 Explain why the torch angle and travel speed are critical for performing gouging.
- 7.5.12 Preheat metal for a specific application.
- 7.5.13 Post heat metal for a specific application/stress relief
- 7.5.14 Pierce holes and cut slots.
- 7.5.15 Cut 90 degree and beveled edges on mild steel plate
- 7.5.16 Cut circles free hand and with guide.
- 7.5.17 Layout, cut, and fit plate, and structural shapes.
- 7.5.18 Select welding/brazing rod for specific application.
- 7.5.19 Run ripple bead without filler metal in flat position.
- 7.5.20 Run stringer bead without filler metal in flat position.
- 7.5.21 Run stringer bead and joints with filler metal in flat position.
- 7.5.22 Run stringer bead and joints with filler metal in horizontal position.
- 7.5.23 Run stringer bead and joints with filler metal in vertical position.
- 7.5.24 Run stringer bead and joints with filler metal in overhead position.
- 7.5.25 Braze carbon steel.
- 7.5.26 Braze cast iron.

Advanced

- 7.5.27 Layout, cut, and fit pipe.

Keys to Employability

Technology

1. Selects Technology → Chooses procedures, tools, or equipment including computers and related technologies.
2. Applies Technology to Task → Understands overall intent and proper procedures for setup and operation of equipment.
3. Maintains and Troubleshoots Equipment → Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Standard 7: Oxyfuel Processes – Identify and explain equipment, equipment set up, and techniques that apply to oxyfuel processes.

Topic 6: Operate a motorized, portable oxyfuel gas cutting machine.

Student Competencies

Core

- 7.6.1 Summarize the procedures for performing straight line cutting and bevel cutting with an oxyfuel cutting machine.

Advanced

- 7.6.2 Discuss the operation of portable oxyfuel cutting machines.
- 7.6.3 Describe the controls for portable oxyfuel cutting machines.
- 7.6.4 Explain how to adjust an oxyfuel cutting machine.

Keys to Employability

Thinking Skills

1. Creative Thinking→ Generates new ideas.
2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
3. Problem Solving→ Recognizes problems and devises and implements plan of action.
4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.



Standard 7: Oxyfuel Processes – Identify and explain equipment, equipment set up, and techniques that apply to oxyfuel processes.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 7: Oxyfuel Processes – Identify and explain equipment, equipment set up, and techniques that apply to oxyfuel processes.

Academic Cross Walk

Mathematics

- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles

Mathematics cont.

- 9-10.3.2. Interpret a given visual representation
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.6. Calculate probabilities of compound events using addition and multiplication rules
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.3. Use approximations to compare the standard and metric systems of measurement
- 9-10.4.4. Given a conversion factor, convert between standard and metric measurements
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.9. Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.4. Perform the operations of addition, subtraction, multiplication, and division on algebraic functions
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations (i.e., reflection, translation, dilation) to graph linear, quadratic, and absolute value functions
- 11-12.5.6. Determine and write an equation for a function that models a mathematical relationship

Standard 7: Oxyfuel Processes – Identify and explain equipment, equipment set up, and techniques that apply to oxyfuel processes.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.6. Understand how scientists create and use models to address scientific knowledge
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors
- 9-10.3.1. Classify elements according to similar properties
- 9-10.3.4. Construct a model of an atom
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter

Science cont.

- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid



Standard 7: Oxyfuel Processes – Identify and explain equipment, equipment set up, and techniques that apply to oxyfuel processes.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy



Standard 8: Plasma Arc Cutting (PAC) – Understand the set up, processes, and maintenance of plasma arc cutting (PAC) equipment and procedures.

Topic 1: Identify and understand PAC processes.

Student Competencies

Core

- 8.1.1 Identify and explain safety practices.
- 8.1.2 Identify and explain protective clothing and equipment.
- 8.1.3 Identify and explain fire/explosion prevention.
- 8.1.4 Identify and explain work area ventilation.
- 8.1.5 Identify and explain transferred arc process.
- 8.1.6 Identify and explain non-transferred arc process.

Keys to Employability

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Standard 8: Plasma Arc Cutting (PAC) – Understand the set up, processes, and maintenance of plasma arc cutting (PAC) equipment and procedures.

Topic 2: Identify PAC equipment.

Student Competencies

Core

- 8.2.1 Identify and explain PAC power source-control units.
- 8.2.2 Identify and explain PAC torches.
- 8.2.3 Identify and explain work piece clamp.
- 8.2.4 Identify and explain locating the work-piece lead.

Advanced

- 8.2.5 Identify and explain PAC gases and controls.
- 8.2.6 Identify and explain PAC gases.
- 8.2.7 Identify and explain PAC gas controls.

Keys to Employability

Personal Qualities

- 1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
- 2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
- 3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
- 4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
- 5. Integrity/Honesty→ Chooses ethical courses of action.

Standard 8: Plasma Arc Cutting (PAC) – Understand the set up, processes, and maintenance of plasma arc cutting (PAC) equipment and procedures.

Topic 3: Identify steps to prepare and set up PAC equipment.

Student Competencies

Introductory

- 8.3.1 Identify and explain installing gas cylinders and setting gas parameters.
- 8.3.2 Identify and explain installing a gas cylinder.

Core

- 8.3.3 Identify and explain setting correct cutting amperage.
- 8.3.4 Identify and explain understanding basic operation concerns.
- 8.3.5 Identify and explain moisture.
- 8.3.6 Identify and explain cooling filter.

Advanced

- 8.3.7 Demonstrate installing gas cylinders and setting gas parameters.
- 8.3.8 Demonstrate installing a gas cylinder.

Keys to Employability

Basic Skills

1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
5. Speaking→ Organizes ideas and communicates orally.

Information

1. Acquires and Evaluates Information.
2. Organizes and Maintains Information.
3. Interprets and Communicates Information.
4. Uses Computers to Process Information.

Standard 8: Plasma Arc Cutting (PAC) – Understand the set up, processes, and maintenance of plasma arc cutting (PAC) equipment and procedures.

Topic 4: Use PAC equipment to make various types of cuts.

Student Competencies

Core

- 8.4.1 Demonstrate square-cutting metal.
- 8.4.2 Demonstrate bevel-cutting metal.
- 8.4.3 Demonstrate piercing and slot-cutting in metal.

Keys to Employability

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills.
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Standard 8: Plasma Arc Cutting (PAC) – Understand the set up, processes, and maintenance of plasma arc cutting (PAC) equipment and procedures.

Topic 5: Identify the process to properly store equipment and clean the work area after use.

Student Competencies

Introductory

8.5.1 Identify and explain storing and cleaning techniques.

Advanced

8.5.2 Demonstrate storing and cleaning techniques.

Keys to Employability

Thinking Skills

1. Creative Thinking→ Generates new ideas.
2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
3. Problem Solving→ Recognizes problems and devises and implements plan of action.
4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Technology

1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Standard 8: Plasma Arc Cutting (PAC) – Understand the set up, processes, and maintenance of plasma arc cutting (PAC) equipment and procedures.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 8: Plasma Arc Cutting (PAC) – Understand the set up, processes, and maintenance of plasma arc cutting (PAC) equipment and procedures.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools

Mathematics cont.

- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.3. Identify the variable, sample, and population in a well-designed study
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.6. Calculate probabilities of compound events using addition and multiplication rules
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.3. Use approximations to compare the standard and metric systems of measurement
- 9-10.4.4. Given a conversion factor, convert between standard and metric measurements
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.9. Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions
- 11-12.5.6. Determine and write an equation for a function that models a mathematical relationship

Standard 8: Plasma Arc Cutting (PAC) – Understand the set up, processes, and maintenance of plasma arc cutting (PAC) equipment and procedures.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors
- 9-10.3.1. Classify elements according to similar properties.
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations

Science cont.

- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid

Standard 8: Plasma Arc Cutting (PAC) – Understand the set up, processes, and maintenance of plasma arc cutting (PAC) equipment and procedures.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy

Standard 9: Air Carbon Arc Cutting and Gouging (CAC-A) – Identify the steps for installation, preparation, and operation of air carbon arc cutting and gouging equipment.

Topic 1: Identify and explain the CAC-A process and equipment.

Student Competencies

Core

- 9.1.1 Identify and explain safety practices.
- 9.1.2 Identify and explain the CAC-A process.
- 9.1.3 Identify and explain CAC-A equipment.
- 9.1.4 Identify and explain CAC-A torch and attachments.
- 9.1.5 Identify and explain CAC-A cutting power supply options.
- 9.1.6 Identify and explain CAC-A Torch Air Supply.

Keys to Employability

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
- 5. Speaking→ Organizes ideas and communicates orally.

Information

- 1. Acquires and Evaluates Information.
- 2. Organizes and Maintains Information.
- 3. Interprets and Communicates Information.
- 4. Uses Computers to Process Information.

Standard 9: Air Carbon Arc Cutting and Gouging (CAC-A) – Identify the steps for installation, preparation, and operation of air carbon arc cutting and gouging equipment.

Topic 2: Identify steps to select and install CAC-A electrodes.

Student Competencies

Core

- 9.2.1 Identify and explain CAC-A electrodes.
- 9.2.2 Identify and explain electrode types, styles, sizes, and amperages.

Keys to Employability

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Technology

- 1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
- 2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
- 3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Standard 9: Air Carbon Arc Cutting and Gouging (CAC-A) – Identify the steps for installation, preparation, and operation of air carbon arc cutting and gouging equipment.

Topic 3: Identify steps to prepare the work area and CAC-A equipment for safe operation.

Student Competencies

Core

- 9.3.1 Prepare work area for CAC-A.
- 9.3.2 Set up CAC-A equipment.
- 9.3.3 Operate CAC-A equipment on selected material.

Keys to Employability

Personal Qualities

- 1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
- 2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
- 3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
- 4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
- 5. Integrity/Honesty→ Chooses ethical courses of action.

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Standard 9: Air Carbon Arc Cutting and Gouging (CAC-A) – Identify the steps for installation, preparation, and operation of air carbon arc cutting and gouging equipment.

Topic 4: Use CAC-A equipment for washing and gouging activities.

Student Competencies

Core

- 9.4.1 Identify and explain CAC-A planning.
- 9.4.2 Demonstrate controlling groove depth and contour
- 9.4.3 Inspect CAC-A cut surfaces.
- 9.4.4 Demonstrate CAC-A washing and gouging activities.

Keys to Employability

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills.
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Standard 9: Air Carbon Arc Cutting and Gouging (CAC-A) – Identify the steps for installation, preparation, and operation of air carbon arc cutting and gouging equipment.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 9: Air Carbon Arc Cutting and Gouging (CAC-A) – Identify the steps for installation, preparation, and operation of air carbon arc cutting and gouging equipment.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools

Mathematics cont.

- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.3. Identify the variable, sample, and population in a well-designed study
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.6. Calculate probabilities of compound events using addition and multiplication rules
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.3. Use approximations to compare the standard and metric systems of measurement
- 9-10.4.4. Given a conversion factor, convert between standard and metric measurements
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.9. Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions
- 11-12.5.6. Determine and write an equation for a function that models a mathematical relationship

Standard 9: Air Carbon Arc Cutting and Gouging (CAC-A) – Identify the steps for installation, preparation, and operation of air carbon arc cutting and gouging equipment.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 9-10.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.5. Understand principles governing evolution and equilibrium within systems
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors

Science cont.

- 9-10.3.1. Classify elements according to similar properties
- 9-10.3.4. Construct a model of an atom
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid

Standard 9: Air Carbon Arc Cutting and Gouging (CAC-A) – Identify the steps for installation, preparation, and operation of air carbon arc cutting and gouging equipment.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy

Standard 10: Shielded Metal Arc Welding (SMAW): Equipment and Setup – Identify and explain equipment, equipment set up, and electrical current that apply to shielded metal arc welding.

Topic 1: Identify and explain SMAW safety.

Student Competencies

Core

- 10.1.1 Explain how SMAW is performed.
- 10.1.2 Discuss the welding current and arc.
- 10.1.3 Discuss the significance of work lead location during welding.
- 10.1.4 Explain the types of welding for which AC and DC current are used.
- 10.1.5 Compare and contrast the two general methods for striking an arc.
- 10.1.6 Compare and contrast AC and DC power.
- 10.1.7 Define polarity and point out that it only applies to DC current.
- 10.1.8 Discuss the welding heating effect caused by polarity.

Keys to Employability

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills.
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Standard 10: Shielded Metal Arc Welding (SMAW): Equipment and Setup – Identify and explain equipment, equipment set up, and electrical current that apply to shielded metal arc welding.

Topic 2: Identify and explain welding electrical current.

Student Competencies

Core

- 10.2.1 Explain how the voltage in welding machines is stepped down.
- 10.2.2 Define and discuss voltage.
- 10.2.3 Explain variable-voltage, constant-current power.
- 10.2.4 Define and discuss amperage.

Keys to Employability

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
- 5. Speaking→ Organizes ideas and communicates orally.

Standard 10: Shielded Metal Arc Welding (SMAW): Equipment and Setup – Identify and explain equipment, equipment set up, and electrical current that apply to shielded metal arc welding.

Topic 3: Identify and explain arc welding machines.

Student Competencies

Core

- 10.3.1 Explain the operation of engine-driven generator and alternator machines.
- 10.3.2 Identify common engine controls.
- 10.3.3 Explain how SMAW machine ratings are determined.
- 10.3.4 Describe the operation of circuit breakers in welding machines.
- 10.3.5 Describe the construction of welding cables.
- 10.3.6 Explain the problems that occur if welding cables are equipped with improper or poorly secured end connections.

Advanced

- 10.3.7 Identify how SMAW machines are classified.
- 10.3.8 Compare and contrast transformers, transformer rectifiers, and engine-driven generators.
- 10.3.9 Explain the operation of transformer welding machines and transformer-rectifier welding machines.
- 10.3.10 Discuss applications for inverter power sources.

Keys to Employability

Personal Qualities

- 1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
- 2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
- 3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
- 4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
- 5. Integrity/Honesty→ Chooses ethical courses of action.

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Standard 10: Shielded Metal Arc Welding (SMAW): Equipment and Setup – Identify and explain equipment, equipment set up, and electrical current that apply to shielded metal arc welding.

Topic 4: Explain setting up engine driven arc welding equipment.

Student Competencies

Core

- 10.4.1 Identify the factors considered when selecting SMAW equipment.
- 10.4.2 Discuss safe placement of welding machines and warn the trainees of the dangers of carbon monoxide poisoning.
- 10.4.3 Discuss safe transportation of welding machines.
- 10.4.4 Explain the procedures for stringing welding cables.
- 10.4.5 Describe how to locate a work lead clamp properly.
- 10.4.6 Discuss the equipment damage that can be caused by welding current.
- 10.4.7 List the checks that should be performed before starting a welding machine.
- 10.4.8 Explain the damage caused by adding water to radiators containing antifreeze and by mixing gasoline and diesel fuel.
- 10.4.9 Discuss proper procedures for starting, stopping, and maintaining engines.

Keys to Employability

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Information

- 1. Acquires and Evaluates Information.
- 2. Organizes and Maintains Information.
- 3. Interprets and Communicates Information.
- 4. Uses Computers to Process Information.

Standard 10: Shielded Metal Arc Welding (SMAW): Equipment and Setup – Identify and explain equipment, equipment set up, and electrical current that apply to shielded metal arc welding.

Topic 5: Identify and explain tools for weld cleaning.

Student Competencies

Core

- 10.5.1 List typical preventative maintenance tasks.
- 10.5.2 Provide examples of hand tools used in cleaning welds.

Advanced

- 10.5.3 Provide examples of pneumatic weld flux chippers and needs scalers.

Keys to Employability

Technology

- 1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
- 2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
- 3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.



Standard 10: Shielded Metal Arc Welding (SMAW): Equipment and Setup – Identify and explain equipment, equipment set up, and electrical current that apply to shielded metal arc welding.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 10: Shielded Metal Arc Welding (SMAW): Equipment and Setup – Identify and explain equipment, equipment set up, and electrical current that apply to shielded metal arc welding.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest

Mathematics cont.

- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.1. Construct appropriate displays of given data
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.3. Identify the variable, sample, and population in a well-designed study
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.6. Calculate probabilities of compound events using addition and multiplication rules
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.3. Use approximations to compare the standard and metric systems of measurement
- 9-10.4.4. Given a conversion factor, convert between standard and metric measurements
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.8. Given a formula list, compute the area of a regular polygon
- 9-10.4.9. Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.4. Perform the operations of addition, subtraction, multiplication, and division on algebraic functions
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions
- 11-12.5.6. Determine and write an equation for a function that models a mathematical relationship

Standard 10: Shielded Metal Arc Welding (SMAW): Equipment and Setup – Identify and explain equipment, equipment set up, and electrical current that apply to shielded metal arc welding.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 9-10.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.5. Understand principles governing evolution and equilibrium within systems
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors

Science cont.

- 9-10.3.1. Classify elements according to similar properties.
- 9-10.3.4. Construct a model of an atom
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid



Standard 10: Shielded Metal Arc Welding (SMAW): Equipment and Setup – Identify and explain equipment, equipment set up, and electrical current that apply to shielded metal arc welding.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy



Standard 11: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain classifications and electrode selection for shielded metal arc welding.

Topic 1: Identify factors that affect electrode selection.

Student Competencies

Core

11.1.1 Discuss the function of electrodes in SMAW.

Keys to Employability

Technology

1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Standard 11: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain classifications and electrode selection for shielded metal arc welding.

Topic 2: Explain the American Welding Society (AWS) and the American Society of Mechanical Engineers (ASME) filler metal classification system.

Student Competencies

Core

- 11.2.1 Explain that the AWS A5.XX series of specifications is used in all major welding codes and industries, except where other approvals are specified.
- 11.2.2 Discuss the purpose of the specifications.
- 11.2.3 Explain the electrode classification system.
- 11.2.4 Discuss mild steel electrode characteristics.
- 11.2.5 Point out that SMAW electrodes are sized by wire core diameter.
- 11.2.6 Explain how to interpret electrode markings.

Advanced

11.2.7 Explain the requirements for AWS classification labeling.

Keys to Employability

Personal Qualities

1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
5. Integrity/Honesty→ Chooses ethical courses of action.

Standard 11: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain classifications and electrode selection for shielded metal arc welding.

Topic 3: Identify and select the proper electrode for an identified welding task.

Student Competencies

Core

11.3.1 List the four groups of electrodes.

Advanced

- 11.3.2 Discuss the characteristics and application of fast-freeze electrodes, fast-fill electrodes, and fill-freeze electrodes.
- 11.3.3 Discuss low-hydrogen electrodes.
- 11.3.4 List factors to consider when selecting electrodes.
- 11.3.5 Discuss welding procedure specifications regarding electrodes.

Keys to Employability

Basic Skills

1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
5. Speaking→ Organizes ideas and communicates orally.

Resources

1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Standard 11: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain classifications and electrode selection for shielded metal arc welding.

Topic 4: Identify different types of filler metals.

Student Competencies

Core

- 11.4.1 Explain that the filler metal should be compatible with the base metal.
- 11.4.2 Discuss the ways in which base metal thickness, base metal surface conditions, welding position, joint design, and welding current affect electrode selection.

Keys to Employability

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills.
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Standard 11: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain classifications and electrode selection for shielded metal arc welding.

Topic 5: Explain the storage and control of filler metals.

Student Competencies

Core

- 11.5.1 Explain the code requirements for handling and storage of electrodes.
- 11.5.2 Explain how to inspect filler metals as it is received.
- 11.5.3 Describe the requirements for storing filler metal.
- 11.5.4 Explain the purpose of electrode storage ovens.
- 11.5.5 Discuss electrode exposure times.
- 11.5.6 Describe guidelines for drying electrodes.

Keys to Employability

Information

- 1. Acquires and Evaluates Information.
- 2. Organizes and Maintains Information.
- 3. Interprets and Communicates Information.
- 4. Uses Computers to Process Information.

Standard 11: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain classifications and electrode selection for shielded metal arc welding.

Topic 6: Explain filler metal traceability requirements and how to use applicable code requirements.

Student Competencies

Advanced

- 11.6.1 Explain that traceability requirements vary from site to site and must be followed.

Keys to Employability

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Standard 11: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain classifications and electrode selection for shielded metal arc welding.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
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- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 11: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain classifications and electrode selection for shielded metal arc welding.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchal relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.1. Construct appropriate displays of given data
- 9-10.3.2. Interpret a given visual representation

Mathematics cont.

- 9-10.3.3. Identify the variable, sample, and population in a well-designed study
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.6. Calculate probabilities of compound events using addition and multiplication rules
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.3. Use approximations to compare the standard and metric systems of measurement
- 9-10.4.4. Given a conversion factor, convert between standard and metric measurements
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.8. Given a formula list, compute the area of a regular polygon
- 9-10.4.9. Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.4. Perform the operations of addition, subtraction, multiplication, and division on algebraic functions
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions
- 11-12.5.6. Determine and write an equation for a function that models a mathematical relationship

Standard 11: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain classifications and electrode selection for shielded metal arc welding.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 9-10.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.5. Understand principles governing evolution and equilibrium within systems
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors

Science cont.

- 9-10.3.1. Classify elements according to similar properties.
- 9-10.3.4. Construct a model of an atom
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid



Standard 11: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain classifications and electrode selection for shielded metal arc welding.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy



Standard 12: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain methods, complications, preventative measures, and techniques that apply to bead and fillet welds.

Topic 1: Identify steps to set up SMAW equipment.

Student Competencies

Core

- 12.1.1 List the steps that must be followed to set up arc welding equipment.
- 12.1.2 List the steps that must be followed to prepare a machine for welding.
- 12.1.3 Discuss the amperages used for electrode types and sizes.

Advanced

- 12.1.4 Discuss droop-current machines.
- 12.1.5 Explain that amperage recommendations vary according to several factors.

Keys to Employability

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
- 5. Speaking→ Organizes ideas and communicates orally.

Personal Qualities

- 1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
- 2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
- 3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
- 4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
- 5. Integrity/Honesty→ Chooses ethical courses of action.

Standard 12: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain methods, complications, preventative measures, and techniques that apply to bead and fillet welds.

Topic 2: Describe method of striking and extinguishing an arc.

Student Competencies

Core

- 12.2.1 Explain the scratching method for striking an arc.
- 12.2.2 Explain the tapping method for striking an arc.
- 12.2.3 Demonstrate setting up welding equipment.
- 12.2.4 Explain that striking arcs with low hydrogen electrodes is more difficult than with most other electrodes.
- 12.2.5 Demonstrate how to accurately tap strike an electrode.

Advanced

- 12.2.6 Explain why the scratch method must be used to strike an arc with some machines.

Keys to Employability

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Standard 12: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain methods, complications, preventative measures, and techniques that apply to bead and fillet welds.

Topic 3: Describe causes of arc blow and wander.

Student Competencies

Core

- 12.3.1 Explain the causes and effects of arc blow.

Keys to Employability

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Standard 12: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain methods, complications, preventative measures, and techniques that apply to bead and fillet welds.

Topic 4: Perform stringer, weave, and overlapping beads.

Student Competencies

Core

- 12.4.1 Define stringer and weave beads.
- 12.4.2 Point out that the WPS must be followed when making stringer and weave beads.
- 12.4.3 Discuss solutions to arc shifting or arc wander.
- 12.4.4 Demonstrate the whipping or stepping motion used to control the weld puddle when depositing stringer beads.
- 12.4.5 Point out that face shields must be worn to prevent injury from hot slag.
- 12.4.6 Define the mnemonic LASH (Length & Angle, Speed, Heat) or CALS (current setting, angle of electrode, length of arc, speed of travel)
- 12.4.7 Identify the steps that must be followed to make a restart.
- 12.4.8 Point out that a termination leaves a crater and explain how to fill it.
- 12.4.9 Describe how to tack-weld tabs to a workpiece to eliminate welding starting and stopping points.
- 12.4.10 Demonstrate how to make weave beads using an E6010 or E6011, E7014, E7018, E7024 electrode per position.
- 12.4.11 Discuss proper weave bead width.
- 12.4.12 Describe how overlapping beads are made.
- 12.4.13 Demonstrate how to make overlapping beads using an E6010 or E6011, E7014, E7018, E7024 electrode per position.
- 12.4.14 Demonstrate how to make stringer beads using E6010 or E6011, E7014, E7018, E7024 per position.

Keys to Employability

Interpersonal

1. Participates as a Member of a Team→ Contributes to group effort.
2. Teaches Others New Skills
3. Serves Clients/Customers→ Works to satisfy customers' expectations.
4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Information

1. Acquires and Evaluates Information.
2. Organizes and Maintains Information.
3. Interprets and Communicates Information.
4. Uses Computers to Process Information.

Standard 12: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain methods, complications, preventative measures, and techniques that apply to bead and fillet welds.

Topic 5: Perform fillet welds in the 2F, 3F, and 4F Positions.

Student Competencies

Core

- 12.5.1 Discuss the two types of fillet welds.
- 12.5.2 Demonstrate the difference between equal and unequal leg fillet welds.
- 12.5.3 Emphasize that the site WPS must be followed for fillet welds.
- 12.5.4 Discuss weld stresses and fillet weld contours.
- 12.5.5 Demonstrate how to make fillet welds in the 2F (Horizontal) position with an E6010 or E6011, E7014, E7018, E7024 electrode.
- 12.5.6 Demonstrate how workpieces are tacked together properly.
- 12.5.7 Discuss heat loss in T-joints.
- 12.5.8 Point out that the most common defect for T-joints is undercut on the vertical plate.

Advanced

- 12.5.9 Demonstrate how to make fillet welds in the 3F (Vertical) position with an E6010 or E6011, E7014, E7018 electrode.
- 12.5.10 Emphasize the importance of electrode angle and travel speed.
- 12.5.11 Demonstrate how to use a small triangular weave in vertical welds to control undercut.
- 12.5.12 Demonstrate how to make fillet welds in the 4F (Overhead) position with an E6010 or E6011, E7014, E7018 electrode.

Keys to Employability

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Technology

- 1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
- 2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
- 3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Standard 12: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain methods, complications, preventative measures, and techniques that apply to bead and fillet welds.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
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- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
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- 9.5.1. Identify existing and developing media
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- 12.5.1. Identify existing and developing media

Standard 12: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain methods, complications, preventative measures, and techniques that apply to bead and fillet welds.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
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- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives

Mathematics cont.

- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.3. Use approximations to compare the standard and metric systems of measurement
- 9-10.4.4. Given a conversion factor, convert between standard and metric measurements
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions
- 11-12.5.6. Determine and write an equation for a function that models a mathematical relationship

Standard 12: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain methods, complications, preventative measures, and techniques that apply to bead and fillet welds.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 9-10.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.5. Understand principles governing evolution and equilibrium within systems
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors

Science cont.

- 9-10.3.1. Classify elements according to similar properties.
- 9-10.3.4. Construct a model of an atom
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid

Standard 12: Shielded Metal Arc Welding (SMAW): Electrodes and Selection – Identify and explain methods, complications, preventative measures, and techniques that apply to bead and fillet welds.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy

Standard 13: Shielded Metal Arc Welding (SMAW): Beads and Fillet Welds – Explain and practice methods and positions for groove welds with backing.

Topic 1: Identify and explain groove welds.

Student Competencies

Core

- 13.1.1 Explain what a groove weld is and discuss typical groove weld styles.
- 13.1.2 Explain the difference between single and double groove welds.
- 13.1.3 Define the terms used to describe groove welds.

Advanced

- 13.1.4 Explain why groove welds are used with fillet welds.
- 13.1.5 Explain the purposes for backings.

Keys to Employability

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Standard 13: Shielded Metal Arc Welding (SMAW): Beads and Fillet Welds – Explain and practice methods and positions for groove welds with backing.

Topic 2: Identify the steps to set up shielded metal arc welding (SMAW) equipment for making V-groove welds.

Student Competencies

Core

- 13.2.1 Emphasize the need for proper arc preparation.
- 13.2.2 Explain how to prepare a weld coupon for practicing welds.
- 13.2.3 Discuss using angle iron as a bevel guide.
- 13.2.4 Explain alternate joint preparation for welding in the horizontal position.
- 13.2.5 Explain why weld coupons should be reused.
- 13.2.6 Discuss general guidelines for using low-hydrogen electrodes.
- 13.2.7 Discuss the dangers of carelessly discarding electrode stubs.
- 13.2.8 Explain how to prepare the welding machine for making groove welds.
- 13.2.9 Demonstrate how to prepare the welding machine for making groove welds.

Keys to Employability

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
- 5. Speaking→ Organizes ideas and communicates orally.

Personal Qualities

- 1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
- 2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
- 3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
- 4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
- 5. Integrity/Honesty→ Chooses ethical courses of action.

Information

- 1. Acquires and Evaluates Information.
- 2. Organizes and Maintains Information.
- 3. Interprets and Communicates Information.
- 4. Uses Computers to Process Information.

Standard 13: Shielded Metal Arc Welding (SMAW): Beads and Fillet Welds – Explain and practice methods and positions for groove welds with backing.

Topic 3: Perform SMAW for V-groove welds with backing in the 1G, 2G, 3G, and 4G positions.

Student Competencies

Core

- 13.3.1 Point out that the V-groove with steel backing is the standard AWS qualification test for plate welding.
- 13.3.2 Define the 1G (Flat), 2G (Horizontal), 3G (Vertical), and 4G (Overhead) weld positions.
- 13.3.3 Point out that backing can be left in place or removed.
- 13.3.4 Explain that groove welds must not have excessive reinforcement, underfill, undercut, or overlap.
- 13.3.5 Point out that the WPS must be followed when making groove welds.
- 13.3.6 Demonstrate how to make V-groove welds with backing in the 1G position using E6010 or E6011, E7018, E7024 and E7014 electrodes.
- 13.3.7 Discuss proper handling of hot practice coupons.
- 13.3.8 Demonstrate how to make V-groove welds with backing in the 2G position using E6010 or E6011, E7018, and E7014.
- 13.3.9 Emphasize the importance of the root pass.

Advanced

- 13.3.10 Demonstrate how to make V-groove welds with backing in the 3G position using E6010 or E6011, E7018, E7024 and E7014.
- 13.3.11 Demonstrate how to make V-groove welds with backing in the 4G position using E6010 or E6011, E7018, and E7014.

Keys to Employability

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Technology

- 1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
- 2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
- 3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.



Standard 13: Shielded Metal Arc Welding (SMAW): Beads and Fillet Welds – Explain and practice methods and positions for groove welds with backing.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 13: Shielded Metal Arc Welding (SMAW): Beads and Fillet Welds – Explain and practice methods and positions for groove welds with backing.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives

Mathematics cont.

- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.1. Construct appropriate displays of given data
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.6. Calculate probabilities of compound events using addition and multiplication rules
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.3. Use approximations to compare the standard and metric systems of measurement
- 9-10.4.4. Given a conversion factor, convert between standard and metric measurements
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.9. Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions
- 11-12.5.6. Determine and write an equation for a function that models a mathematical relationship

Standard 13: Shielded Metal Arc Welding (SMAW): Beads and Fillet Welds – Explain and practice methods and positions for groove welds with backing.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 9-10.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.5. Understand principles governing evolution and equilibrium within systems
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors

Science cont.

- 9-10.3.1. Classify elements according to similar properties.
- 9-10.3.4. Construct a model of an atom
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid

Standard 13: Shielded Metal Arc Welding (SMAW): Beads and Fillet Welds – Explain and practice methods and positions for groove welds with backing.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy

Standard 14: Shielded Metal Arc Welding (SMAW): Groove Welds with Backing – Identify procedures to prepare and perform open V-groove welds.

Topic 1: Identify the steps to prepare SMAW equipment for open-root V-groove welds.

Student Competencies

Core

- 14.1.1 Explain that an open V-groove weld is a nonstandard term for one type of open-root groove weld without backing or an insert.
- 14.1.2 Explain how to prepare a weld coupon for practicing welds.
- 14.1.3 List the steps that must be followed to prepare a welding machine for open root V-groove welds.
- 14.1.4 Discuss amperage settings for various electrode types and sizes.
- 14.1.5 Explain that the most difficult part of making an open-root V-groove weld is the root pass.
- 14.1.6 Explain why grinding is needed more often when using low-hydrogen electrodes.
- 14.1.7 Explain why single V-groove welds can be finished with a back weld on flat plates only.
- 14.1.8 Discuss the defects that make a groove weld unacceptable.

Keys to Employability

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
- 5. Speaking→ Organizes ideas and communicates orally.

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Standard 14: Shielded Metal Arc Welding (SMAW): Groove Welds with Backing – Identify procedures to prepare and perform open V-groove welds.

Topic 2: Identify the steps and perform open-root V-groove welds in G1, G2, G3, and 4G positions.

Student Competencies

Core

- 14.2.1 Demonstrate how to make open-root V-groove welds in the 1G position using E6010 root pass and E7018 fill and cap pass electrodes.
- 14.2.2 Demonstrate how to make open-root V-groove welds in the 2G position using E6010 root pass and E7018 fill and cap pass electrodes.

Advanced

- 14.2.3 Demonstrate how to make open-root V-groove welds in the 3G position using E6010 root pass and E7018 fill and cap pass electrodes.
- 14.2.4 Demonstrate how to make open-root V-groove welds in the 4G position using E6010 root pass and E7018 fill and cap pass electrodes.

Keys to Employability

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills.
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Information

- 1. Acquires and Evaluates Information.
- 2. Organizes and Maintains Information.
- 3. Interprets and Communicates Information.
- 4. Uses Computers to Process Information.

Technology

- 1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
- 2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
- 3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Standard 14: Shielded Metal Arc Welding (SMAW): Groove Welds with Backing – Identify procedures to prepare and perform open V-groove welds.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 14: Shielded Metal Arc Welding (SMAW): Groove Welds with Backing – Identify procedures to prepare and perform open V-groove welds.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives

Mathematics cont.

- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.3. Use approximations to compare the standard and metric systems of measurement
- 9-10.4.4. Given a conversion factor, convert between standard and metric measurements
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.8. Given a formula list, compute the area of a regular polygon
- 9-10.4.9. Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.4. Perform the operations of addition, subtraction, multiplication, and division on algebraic functions
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions

Standard 14: Shielded Metal Arc Welding (SMAW): Groove Welds with Backing – Identify procedures to prepare and perform open v-groove welds.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 9-10.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.5. Understand principles governing evolution and equilibrium within systems
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors

Science cont.

- 9-10.3.1. Classify elements according to similar properties.
- 9-10.3.4. Construct a model of an atom
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid



Standard 14: Shielded Metal Arc Welding (SMAW): Groove Welds with Backing – Identify procedures to prepare and perform open v-groove welds.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy

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Standard 15: Gas Metal Arc Welding (GMAW): Equipment and Filler Metals – Explain the equipment and filler metals that apply to gas metal arc welding.

Topic 1: Explain GMAW safety.

Student Competencies

Core

- 15.1.1 Identify and explain protective clothing and equipment.
- 15.1.2 Identify and explain fire/explosion prevention.
- 15.1.3 Identify and explain work area ventilation.

Keys to Employability

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Standard 15: Gas Metal Arc Welding (GMAW): Equipment and Filler Metals – Explain the equipment and filler metals that apply to gas metal arc welding.

Topic 2: Explain the characteristics of welding current and power sources.

Student Competencies

Core

- 15.2.1 Identify and explain voltage.
- 15.2.2 Identify and explain amperage.
- 15.2.3 Identify and explain types of welding power sources.

Advanced

- 15.2.4 Identify and explain transformer-rectifier power sources.
- 15.2.5 Identify and explain engine-driven generator and alternator power sources.
- 15.2.6 Identify and explain inverter power sources.
- 15.2.7 Identify and explain power source ratings.

Keys to Employability

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
- 5. Speaking→ Organizes ideas and communicates orally.

Standard 15: Gas Metal Arc Welding (GMAW): Equipment and Filler Metals – Explain the equipment and filler metals that apply to gas metal arc welding.

Topic 3: Identify and explain the use of GMAW equipment.

Student Competencies

Core

- 15.3.1 Identify and explain GMAW metal transfer modes. (i.e. short circuiting, pulse arc, spray transfer)
- 15.3.2 Identify and explain GMAW power sources.
- 15.3.3 Identify and explain slope.
- 15.3.4 Identify and explain pinch effect and inductance.
- 15.3.5 Identify and explain arc blow.
- 15.3.6 Identify and explain welding cable.
- 15.3.7 Identify and explain welding cable end connections.
- 15.3.8 Identify and explain external wire feeders.
- 15.3.9 Identify and explain shielding gas supply.
- 15.3.10 Identify and explain gas regulators/flowmeters.

Advanced

- 15.3.11 Identify and explain GMAW guns.

Keys to Employability

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Personal Qualities

- 1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
- 2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
- 3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
- 4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
- 5. Integrity/Honesty→ Chooses ethical courses of action.

Standard 15: Gas Metal Arc Welding (GMAW): Equipment and Filler Metals – Explain the equipment and filler metals that apply to gas metal arc welding.

Topic 4: Identify and explain the use of GMAW shielding gases and filler metals.

Student Competencies

Introductory

- 15.4.1 Identify and explain argon.
- 15.4.2 Identify and explain helium.
- 15.4.3 Identify and explain carbon dioxide.
- 15.4.4 Identify and explain gas mixtures.
- 15.4.5 Identify and explain gas selection.

Core

- 15.4.6 Identify and explain shielding gas characteristics.
- 15.4.7 Identify and explain gas flow rate.
- 15.4.8 Identify and explain GMAW filler metals.
- 15.4.9 Identify and explain carbon steel filler metals.

Advanced

- 15.4.10 Identify and explain low-alloy steel filler metals.
- 15.4.11 Identify and explain stainless steel filler metals.
- 15.4.12 Identify and explain aluminum and aluminum alloy filler metals.
- 15.4.13 Identify and explain copper and copper alloy filler metals.
- 15.4.14 Identify and explain magnesium alloy filler metals.
- 15.4.15 Identify and explain titanium and titanium alloy filler metals.

Keys to Employability

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills.
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Information

- 1. Acquires and Evaluates Information.
- 2. Organizes and Maintains Information.
- 3. Interprets and Communicates Information.
- 4. Uses Computers to Process Information.

Standard 15: Gas Metal Arc Welding (GMAW): Equipment and Filler Metals – Explain the equipment and filler metals that apply to gas metal arc welding.

Topic 5: Identify the steps to set up GMAW equipment and identify tools for weld cleaning.

Student Competencies

Core

- 15.5.1 Identify and explain connecting the shielding gas.
- 15.5.2 Identify and explain selecting and installing filler wire.
- 15.5.3 Identify and explain placing the work-piece clamp.
- 15.5.4 Identify and explain energizing the power source.
- 15.5.5 Identify and explain performing preventative maintenance.
- 15.5.6 Identify and explain hand tools for weld cleaning.

Advanced

- 15.5.7 Identify and explain selecting a GMAW power source.
- 15.5.8 Identify and explain positioning of equipment.
- 15.5.9 Identify and explain moving welding power sources.
- 15.5.10 Identify and explain starting engine-driven generators and alternators.
- 15.5.11 Identify and explain performing pre-start checks.
- 15.5.12 Identify and explain starting the engine.
- 15.5.13 Identify and explain stopping the engine.

Keys to Employability

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Technology

- 1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
- 2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
- 3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Standard 15: Gas Metal Arc Welding (GMAW): Equipment and Filler Metals – Explain the equipment and filler metals that apply to gas metal arc welding.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 15: Gas Metal Arc Welding (GMAW): Equipment and Filler Metals – Explain the equipment and filler metals that apply to gas metal arc welding.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.

Mathematics cont.

- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.3. Identify the variable, sample, and population in a well-designed study
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.8. Given a formula list, compute the area of a regular polygon
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions

Standard 15: Gas Metal Arc Welding (GMAW): Equipment and Filler Metals – Explain the equipment and filler metals that apply to gas metal arc welding.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 9-10.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.5. Understand principles governing evolution and equilibrium within systems
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors

Science cont.

- 9-10.3.1. Classify elements according to similar properties.
- 9-10.3.4. Construct a model of an atom
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid



Standard 15: Gas Metal Arc Welding (GMAW): Equipment and Filler Metals – Explain the equipment and filler metals that apply to gas metal arc welding.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy



Standard 16: Gas Metal Arc Welding (GMAW): Plate – Identify and explain the equipment and weld types that apply to gas metal arc welding.

Topic 1: Identify and explain GMAW equipment set up.

Student Competencies

Core

- 16.1.1 Identify and explain preparing the welding area.
- 16.1.2 Identify and explain preparing the practice weld coupons.
- 16.1.3 Identify and demonstrate the welding machine.
- 16.1.4 Identify and demonstrate welding amperage.
- 16.1.5 Identify and demonstrate welding travel speed.
- 16.1.6 Identify and demonstrate gun position.
- 16.1.7 Identify and demonstrate work angle.
- 16.1.8 Identify and demonstrate travel angle.
- 16.1.9 Identify and demonstrate electrode extension distance.
- 16.1.10 Identify and demonstrate gas nozzle cleaning.

Keys to Employability

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Standard 16: Gas Metal Arc Welding (GMAW): Plate – Identify and explain the equipment and weld types that apply to gas metal arc welding.

Topic 2: Identify and demonstrate bead types.

Student Competencies

Core

- 16.2.1 Demonstrate stringer beads.
- 16.2.2 Demonstrate weave beads.
- 16.2.3 Demonstrate weld restarts.
- 16.2.4 Identify and explain weld terminations.
- 16.2.5 Identify and explain overlapping beads.
- 16.2.6 Practice overlapping stringer and weave beads.
- 16.2.7 Build a pad with stringer or weave beads.

Keys to Employability

Personal Qualities

- 1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
- 2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
- 3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
- 4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
- 5. Integrity/Honesty→ Chooses ethical courses of action.

Standard 16: Gas Metal Arc Welding (GMAW): Plate – Identify and explain the equipment and weld types that apply to gas metal arc welding.

Topic 3: Identify and explain fillet welds.

Student Competencies

Core

- 16.3.1 Practice flat 1F position fillet welds.
- 16.3.2 Practice horizontal 2F position fillet welds.
- 16.3.3 Identify and explain vertical weave bead fillet welds.
- 16.3.4 Identify and explain vertical stringer bead fillet welds.

Advanced

- 16.3.5 Practice vertical 3F position fillet welds.
- 16.3.6 Practice overhead 4F position fillet welds.

Keys to Employability

Basic Skills

1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
5. Speaking→ Organizes ideas and communicates orally.

Thinking Skills

1. Creative Thinking→ Generates new ideas.
2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
3. Problem Solving→ Recognizes problems and devises and implements plan of action.
4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Information

1. Acquires and Evaluates Information.
2. Organizes and Maintains Information.
3. Interprets and Communicates Information.
4. Uses Computers to Process Information.

Standard 16: Gas Metal Arc Welding (GMAW): Plate – Identify and explain the equipment and weld types that apply to gas metal arc welding.

Topic 4: Identify and explain open-root V-groove welds.

Student Competencies

Core

- 16.4.1 Identify and explain root pass.
- 16.4.2 Identify and explain groove weld positions.
- 16.4.3 Identify and explain acceptable and unacceptable groove weld profiles.
- 16.4.4 Practice flat 1G position open-root V-groove welds.
- 16.4.5 Practice horizontal 2G position open-root V-groove welds.

Advanced

- 16.4.6 Practice vertical 3G position open root V-groove welds.
- 16.4.7 Identify and explain vertical open-root V-groove weld with stringer beads.
- 16.4.8 Identify and explain vertical open-root V-groove weld with weave beads.
- 16.4.9 Practice overhead 4G position open-root V-groove welds.

Keys to Employability

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Technology

- 1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
- 2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
- 3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.



Standard 16: Gas Metal Arc Welding (GMAW): Plate – Identify and explain the equipment and weld types that apply to gas metal arc welding.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 16: Gas Metal Arc Welding (GMAW): Plate – Identify and explain the equipment and weld types that apply to gas metal arc welding.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.

Mathematics cont.

- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.3. Identify the variable, sample, and population in a well-designed study
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.8. Given a formula list, compute the area of a regular polygon
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions

Standard 16: Gas Metal Arc Welding (GMAW): Plate – Identify and explain the equipment and weld types that apply to gas metal arc welding.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 9-10.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.5. Understand principles governing evolution and equilibrium within systems
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors

Science cont.

- 9-10.3.1. Classify elements according to similar properties.
- 9-10.3.4. Construct a model of an atom
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid

Standard 16: Gas Metal Arc Welding (GMAW): Plate – Identify and explain the equipment and weld types that apply to gas metal arc welding.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy

Standard 17: FCAW (Flux Core and/or Metal Core Wire): Equipment and Filler Metals – Explain the equipment and filler metals that apply to flux cored arc welding.

Topic 1: Explain flux cored arc welding (FCAW) safety.

Student Competencies

Core

- 17.1.1 Identify and explain protective clothing and equipment.
- 17.1.2 Identify and explain fire/explosion prevention.
- 17.1.3 Identify and explain work area ventilation.

Keys to Employability

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Standard 17: FCAW (Flux Core and/or Metal Core Wire): Equipment and Filler Metals – Explain the equipment and filler metals that apply to flux cored arc welding.

Topic 2: Explain the characteristics of welding current and power sources.

Student Competencies

Core

- 17.2.1 Identify and explain voltage.
- 17.2.2 Identify and explain amperage.
- 17.2.3 Identify and explain types of welding power sources.

Advanced

- 17.2.4 Identify and explain transformer-rectifier power sources.
- 17.2.5 Identify and explain engine-driven generator and alternator power sources.
- 17.2.6 Identify and explain inverter power sources.
- 17.2.7 Identify and explain power source ratings.

Keys to Employability

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
- 5. Speaking→ Organizes ideas and communicates orally.

Standard 17: FCAW (Flux Core and/or Metal Core Wire): Equipment and Filler Metals – Explain the equipment and filler metals that apply to flux cored arc welding.

Topic 3: Identify and explain the use of FCAW equipment.

Student Competencies

Core

- 17.3.1 Identify and explain FCAW metal transfer modes.
- 17.3.2 Identify and explain FCAW power sources.
- 17.3.3 Identify and explain slope.
- 17.3.4 Identify and explain pinch effect and inductance.
- 17.3.5 Identify and explain arc blow.
- 17.3.6 Identify and explain welding cable.
- 17.3.7 Identify and explain welding cable end connections.
- 17.3.8 Identify and explain external wire feeders.
- 17.3.9 Identify and explain shielding gas supply.
- 17.3.10 Identify and explain gas regulators/flowmeters.

Advanced

- 17.3.11 Demonstrate FCAW metal transfer process.
- 17.3.12 Demonstrate FCAW weld penetration.
- 17.3.13 Demonstrate FCAW joint design.
- 17.3.14 Demonstrate FCAW-G and/or FCAW-S guns.

Keys to Employability

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Personal Qualities

- 1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
- 2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
- 3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
- 4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control
- 5. Integrity/Honesty→ Chooses ethical courses of action.

Standard 17: FCAW (Flux Core and/or Metal Core Wire): Equipment and Filler Metals – Explain the equipment and filler metals that apply to flux cored arc welding.

Topic 4: Identify and explain the use of FCAW shielding gases and filler metals.

Student Competencies

Introductory

- 17.4.1 Identify and explain argon.
- 17.4.2 Identify and explain helium.
- 17.4.3 Identify and explain carbon dioxide.
- 17.4.4 Identify and explain gas mixtures.
- 17.4.5 Identify and explain gas selection.

Core

- 17.4.6 Identify and explain shielding gas characteristics.
- 17.4.7 Identify and explain gas flow rate.
- 17.4.8 Identify and explain FCAW filler metals.
- 17.4.9 Identify and explain carbon steel filler metals.

Advanced

- 17.4.10 Identify and explain low-alloy steel filler metals.
- 17.4.11 Identify and explain stainless steel filler metals.
- 17.4.12 Identify and explain aluminum and aluminum alloy filler metals.
- 17.4.13 Identify and explain copper and copper alloy filler metals.
- 17.4.14 Identify and explain magnesium alloy filler metals.
- 17.4.15 Identify and explain titanium and titanium alloy filler metals.
- 17.4.16 Identify and explain FCAW filler metals.
- 17.4.17 Identify and explain carbon steel flux cored electrodes.
- 17.4.18 Identify and explain low-alloy steel flux cored electrodes.
- 17.4.19 Identify and explain stainless steel flux cored electrodes and rods.

Keys to Employability

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Information

- 1. Acquires and Evaluates Information.
- 2. Organizes and Maintains Information.
- 3. Interprets and Communicates Information.
- 4. Uses Computers to Process Information.

Standard 17: FCAW (Flux Core and/or Metal Core Wire): Equipment and Filler Metals – Explain the equipment and filler metals that apply to flux cored arc welding.

Topic 5: Identify the steps to set up FCAW equipment and identify tools for weld cleaning.

Student Competencies

Core

- 17.5.1 Identify and explain connecting the shielding gas.
- 17.5.2 Identify and explain selecting and installing filler wire.
- 17.5.3 Identify and explain placing the work-piece clamp.
- 17.5.4 Identify and explain energizing the power source.
- 17.5.5 Identify and explain performing preventative maintenance.
- 17.5.6 Identify and explain hand tools for weld cleaning.

Advanced

- 17.5.7 Identify and explain selecting an FCAW power source.
- 17.5.8 Identify and explain position the equipment.
- 17.5.9 Identify and explain moving welding power sources.
- 17.5.10 Identify and explain starting engine-driven generators and alternators.
- 17.5.11 Identify and explain performing pre-start checks.
- 17.5.12 Identify and explain starting the engine.
- 17.5.13 Identify and explain stopping the engine.

Keys to Employability

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Technology

- 1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
- 2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
- 3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Standard 17: FCAW (Flux Core and/or Metal Core Wire): Equipment and Filler Metals – Explain the equipment and filler metals that apply to flux cored arc welding.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 17: FCAW (Flux Core and/or Metal Core Wire): Equipment and Filler Metals – Explain the equipment and filler metals that apply to flux cored arc welding.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.

Mathematics cont.

- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.3. Identify the variable, sample, and population in a well-designed study
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.8. Given a formula list, compute the area of a regular polygon
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions

Standard 17: FCAW (Flux Core and/or Metal Core Wire): Equipment and Filler Metals – Explain the equipment and filler metals that apply to flux cored arc welding.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 9-10.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.5. Understand principles governing evolution and equilibrium within systems
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors
- 9-10.3.1. Classify elements according to similar properties.
- 9-10.3.4. Construct a model of an atom
- 9-10.3.5. Recognize the reactants and products in a chemical reaction

Science cont.

- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid

Standard 17: FCAW (Flux Core and/or Metal Core Wire): Equipment and Filler Metals – Explain the equipment and filler metals that apply to flux cored arc welding.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy

Standard 18: FCAW (Flux Core and/or Metal Core Wire): Plate – Identify and explain the equipment and weld types that apply to flux cored arc welding.

Topic 1: Identify and explain FCAW equipment set up.

Student Competencies

Advanced

- 18.1.1 Identify and explain preparing the welding area.
- 18.1.2 Identify and explain preparing the practice weld coupons.
- 18.1.3 Identify and demonstrate welding machine.
- 18.1.4 Identify and demonstrate welding amperage.
- 18.1.5 Identify and demonstrate welding travel speed.
- 18.1.6 Identify and demonstrate gun position.
- 18.1.7 Identify and demonstrate work angle.
- 18.1.8 Identify and demonstrate travel angle.
- 18.1.9 Identify and demonstrate electrode extension, stick-out, and standoff distance.
- 18.1.10 Identify and demonstrate gas nozzle cleaning.

Keys to Employability

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
- 5. Speaking→ Organizes ideas and communicates orally.

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Information

- 1. Acquires and Evaluates Information.
- 2. Organizes and Maintains Information.
- 3. Interprets and Communicates Information.
- 4. Uses Computers to Process Information.

Standard 18: FCAW (Flux Core and/or Metal Core Wire): Plate – Identify and explain the equipment and weld types that apply to flux cored arc welding.

Topic 2: Identify and demonstrate bead types.

Student Competencies

Advanced

- 18.2.1 Demonstrate stringer beads.
- 18.2.2 Demonstrate weave beads.
- 18.2.3 Demonstrate weld restarts.
- 18.2.4 Identify and explain weld terminations.
- 18.2.5 Identify and explain overlapping beads.
- 18.2.6 Practice overlapping stringer and weave beads.
- 18.2.7 Build a pad with stringer or weave beads.

Keys to Employability

Personal Qualities

- 1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
- 2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
- 3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
- 4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
- 5. Integrity/Honesty→ Chooses ethical courses of action.

Standard 18: FCAW (Flux Core and/or Metal Core Wire): Plate – Identify and explain the equipment and weld types that apply to flux cored arc welding.

Topic 3: Identify and explain fillet welds.

Student Competencies

Advanced

- 18.3.1 Practice flat 1F position fillet welds.
- 18.3.2 Practice horizontal 2F position fillet welds.
- 18.3.3 Practice vertical 3F position fillet welds.
- 18.3.4 Identify and explain vertical weave bead fillet welds.
- 18.3.5 Identify and explain vertical stringer bead fillet welds.
- 18.3.6 Practice overhead 4F position fillet welds.

Keys to Employability

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Standard 18: FCAW (Flux Core and/or Metal Core Wire): Plate – Identify and explain the equipment and weld types that apply to flux cored arc welding.

Topic 4: Identify and explain open-root V-groove welds.

Student Competencies

Advanced

- 18.4.1 Identify and explain root pass.
- 18.4.2 Identify and explain groove weld positions.
- 18.4.3 Identify and explain acceptable and unacceptable groove weld profiles.
- 18.4.4 Practice flat 1G position open-root V-groove welds.
- 18.4.5 Practice horizontal 2G position open-root V-groove welds.
- 18.4.6 Practice vertical 3G position open root V-groove welds.
- 18.4.7 Identify and explain vertical open-root V-groove weld with stringer beads.
- 18.4.8 Identify and explain vertical open-root V-groove weld with weave beads.
- 18.4.9 Practice overhead 4G position open-root V-groove welds.

Keys to Employability

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills.
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Technology

- 1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
- 2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
- 3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.



Standard 18: FCAW (Flux Core and/or Metal Core Wire): Plate – Identify and explain the equipment and weld types that apply to flux cored arc welding.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 18: FCAW (Flux Core and/or Metal Core Wire): Plate – Identify and explain the equipment and weld types that apply to flux cored arc welding.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.

Mathematics cont.

- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.3. Identify the variable, sample, and population in a well-designed study
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.8. Given a formula list, compute the area of a regular polygon
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions

Standard 18: FCAW (Flux Core and/or Metal Core Wire): Plate – Identify and explain the equipment and weld types that apply to flux cored arc welding.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 9-10.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.5. Understand principles governing evolution and equilibrium within systems
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors
- 9-10.3.1. Classify elements according to similar properties.
- 9-10.3.4. Construct a model of an atom
- 9-10.3.5. Recognize the reactants and products in a chemical reaction

Science cont.

- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid

Standard 18: FCAW (Flux Core and/or Metal Core Wire): Plate – Identify and explain the equipment and weld types that apply to flux cored arc welding.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy

Standard 19: GTAW: Equipment and Filler Materials – Explain the equipment and filler materials that apply to gas tungsten arc welding.

Topic 1: Explain GTAW safety.

Student Competencies

Advanced

- 19.1.1 Identify and explain safety practices.
- 19.1.2 Identify and explain protective clothing and equipment.
- 19.1.3 Identify and explain fire/explosion prevention.
- 19.1.4 Identify and explain work area ventilation.
- 19.1.5 Identify and explain characteristics of welding current.
- 19.1.6 Identify and explain voltage.
- 19.1.7 Identify and explain amperage.
- 19.1.8 Identify and explain types of welding current.
- 19.1.9 Identify and explain DC welding current.
- 19.1.10 Identify and explain DC polarity.
- 19.1.11 Identify and explain AC welding current.
- 19.1.12 Identify and explain high frequency.

Keys to Employability

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
- 5. Speaking→ Organizes ideas and communicates orally.

Personal Qualities

- 1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
- 2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
- 3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
- 4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
- 5. Integrity/Honesty→ Chooses ethical courses of action.

Standard 19: GTAW: Equipment and Filler Materials – Explain the equipment and filler materials that apply to gas tungsten arc welding.

Topic 2: Identify and explain the use of GTAW equipment.

Student Competencies

Advanced

- 19.2.1 Identify and explain transformer welding machines.
- 19.2.2 Identify and explain transformer-rectifier welding machines.
- 19.2.3 Identify and explain inverter power sources.
- 19.2.4 Identify and explain advanced function and waveform control descriptions.
- 19.2.5 Identify and explain engine-driven generator and alternator welding machines.
- 19.2.6 Identify and explain power source ratings.
- 19.2.7 Identify and explain welding cable.
- 19.2.8 Identify and explain GTAW torches.
- 19.2.9 Identify and explain gas nozzles.
- 19.2.10 Identify and explain tungsten electrodes.
- 19.2.11 Identify and explain shielding gas.
- 19.2.12 Identify and explain argon.
- 19.2.13 Identify and explain helium.
- 19.2.14 Identify and explain cylinder safety.
- 19.2.15 Identify and explain gas regulators/flow meters.
- 19.2.16 Identify and explain remote current control.

Keys to Employability

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Standard 19: GTAW: Equipment and Filler Materials – Explain the equipment and filler materials that apply to gas tungsten arc welding.

Topic 3: Identify and explain the use of GTAW filler metals.

Student Competencies

Advanced

- 19.3.1 Identify and explain carbon steel and low-alloy steel filler metals.
- 19.3.2 Identify and explain stainless steel filler metals.
- 19.3.3 Identify and explain aluminum and aluminum alloy filler metals.
- 19.3.4 Identify and explain copper and copper alloy filler metals.
- 19.3.5 Identify and explain nickel and nickel alloy filler metals.
- 19.3.6 Identify and explain magnesium alloy filler metals.
- 19.3.7 Identify and explain titanium and titanium alloy filler metals.
- 19.3.8 Identify and explain stainless steel flux cored electrodes and rods.

Keys to Employability

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills.
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Information

- 1. Acquires and Evaluates Information.
- 2. Organizes and Maintains Information.
- 3. Interprets and Communicates Information.
- 4. Uses Computers to Process Information.

Standard 19: GTAW: Equipment and Filler Materials – Explain the equipment and filler materials that apply to gas tungsten arc welding.

Topic 4: Identify steps to set up GTAW equipment.

Student Competencies

Advanced

- 19.4.1 Identify and explain gas flow rates for stainless steel.
- 19.4.2 Identify and explain gas flow rates for aluminum.
- 19.4.3 Identify and explain gas flow rates for copper.
- 19.4.4 Identify and explain selecting a GTAW power source.
- 19.4.5 Identify and explain locating the GTAW equipment.
- 19.4.6 Identify and explain connecting the shielding gas.
- 19.4.7 Identify and explain setting the shielding gas flow rate.
- 19.4.8 Identify and explain gas flow rates for carbon steel.
- 19.4.9 Identify and explain selecting the electrode.
- 19.4.10 Identify and explain preparing the electrode.
- 19.4.11 Identify and explain pointing the electrode tip.
- 19.4.12 Identify and explain balling the electrode tip.
- 19.4.13 Identify and explain selecting and installing the nozzle.
- 19.4.14 Identify and explain installing the electrode.

Keys to Employability

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Technology

- 1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
- 2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
- 3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Standard 19: GTAW: Equipment and Filler Materials – Explain the equipment and filler materials that apply to gas tungsten arc welding.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 19: GTAW: Equipment and Filler Materials – Explain the equipment and filler materials that apply to gas tungsten arc welding.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.

Mathematics cont.

- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.3. Identify the variable, sample, and population in a well-designed study
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.8. Given a formula list, compute the area of a regular polygon
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions

Standard 19: GTAW: Equipment and Filler Materials – Explain the equipment and filler materials that apply to gas tungsten arc welding.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 9-10.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.5. Understand principles governing evolution and equilibrium within systems
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors

Science cont.

- 9-10.3.1. Classify elements according to similar properties.
- 9-10.3.4. Construct a model of an atom
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid

Standard 19: GTAW: Equipment and Filler Materials – Explain the equipment and filler materials that apply to gas tungsten arc welding.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy

Standard 20: GTAW: Plate – Identify and explain the equipment and weld types that apply to gas tungsten arc welding.

Topic 1: Identify and explain the use of gas tungsten arc welding techniques.

Student Competencies

Advanced

- 20.1.1 Identify and explain torch travel speed and arc length.
- 20.1.2 Identify and explain torch angles.
- 20.1.3 Identify and explain work angle.
- 20.1.4 Identify and explain travel angle.
- 20.1.5 Identify and explain torch and filler metal handling techniques.
- 20.1.6 Identify and explain freehand technique.
- 20.1.7 Identify and explain walking-the-cup technique.

Keys to Employability

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
- 5. Speaking→ Organizes ideas and communicates orally.

Personal Qualities

- 1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
- 2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
- 3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
- 4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
- 5. Integrity/Honesty→ Chooses ethical courses of action.

Standard 20: GTAW: Plate – Identify and explain the equipment and weld types that apply to gas tungsten arc welding.

Topic 2: Identify and explain bead types.

Student Competencies

Advanced

- 20.2.1 Identify and explain stringer beads.
- 20.2.2 Identify and explain weave beads.
- 20.2.3 Practice stringer beads.
- 20.2.4 Practice weld restarts.
- 20.2.5 Practice weld terminations.
- 20.2.6 Practice overlapping beads.

Keys to Employability

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Standard 20: GTAW: Plate – Identify and explain the equipment and weld types that apply to gas tungsten arc welding.

Topic 3: Identify and explain groove and open V-groove welds.

Student Competencies

Advanced

- 20.3.1 Identify and explain open V-groove root pass techniques.
- 20.3.2 Identify and explain on-the-wire root pass technique.
- 20.3.3 Identify and explain keyhole technique.
- 20.3.4 Identify and explain groove weld positions.
- 20.3.5 Identify and explain acceptable and unacceptable groove weld profiles.
- 20.3.6 Practice flat 1G position open V-groove welds.
- 20.3.7 Practice horizontal beads.
- 20.3.8 Practice vertical beads.
- 20.3.9 Practice horizontal 2G position open V-groove welds.
- 20.3.10 Practice vertical 3G position open V-groove wells.
- 20.3.11 Practice overhead beads.
- 20.3.12 Practice overhead 4G position open V-groove welds.

Keys to Employability

Technology

- 1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
- 2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
- 3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Information

- 1. Acquires and Evaluates Information.
- 2. Organizes and Maintains Information.
- 3. Interprets and Communicates Information.
- 4. Uses Computers to Process Information.



Standard 20: GTAW: Plate – Identify and explain the equipment and weld types that apply to gas tungsten arc welding.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
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- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 20: GTAW: Plate – Identify and explain the equipment and weld types that apply to gas tungsten arc welding.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives

Mathematics cont.

- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.1. Construct appropriate displays of given data
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.3. Identify the variable, sample, and population in a well-designed study
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.6. Calculate probabilities of compound events using addition and multiplication rules
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.3. Use approximations to compare the standard and metric systems of measurement
- 9-10.4.4. Given a conversion factor, convert between standard and metric measurements
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.4. Perform the operations of addition, subtraction, multiplication, and division on algebraic functions
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions
- 11-12.5.6. Determine and write an equation for a function that models a mathematical relationship

Standard 20: GTAW: Plate – Identify and explain the equipment and weld types that apply to gas tungsten arc welding.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 9-10.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.5. Understand principles governing evolution and equilibrium within systems
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors

Science cont.

- 9-10.3.1. Classify elements according to similar properties.
- 9-10.3.4. Construct a model of an atom
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid

Standard 20: GTAW: Plate – Identify and explain the equipment and weld types that apply to gas tungsten arc welding.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy

Standard 21: GTAW: Aluminum Plate – Identify and explain the equipment, characteristics, and weld types that apply to gas tungsten arc welding when using aluminum.

Topic 1: Identify and explain aluminum metallurgy.

Student Competencies

Advanced

- 21.1.1 Identify and explain safety practices.
- 21.1.2 Identify and explain protective clothing and equipment.
- 21.1.3 Identify and explain fire/explosion prevention.
- 21.1.4 Identify and explain work area ventilation.
- 21.1.5 Identify and explain nonheat-treatable alloys.
- 21.1.6 Identify and explain heat-treatable alloys.
- 21.1.7 Identify and explain filler metal alloys.
- 21.1.8 Identify and explain cast aluminum.
- 21.1.9 Identify and explain wrought aluminum.

Keys to Employability

Personal Qualities

- 1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
- 2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
- 3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
- 4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
- 5. Integrity/Honesty→ Chooses ethical courses of action.

Standard 21: GTAW: Aluminum Plate – Identify and explain the equipment, characteristics, and weld types that apply to gas tungsten arc welding when using aluminum.

Topic 2: Explain and identify characteristics of aluminum.

Student Competencies

Advanced

- 21.2.1 Identify and explain surface preparation.
- 21.2.2 Identify and explain aluminum storage.
- 21.2.3 Identify and explain aluminum cleaning.
- 21.2.4 Identify and explain chemical aluminum preparation precautions.
- 21.2.5 Identify and explain weld problems.
- 21.2.6 Identify and explain porosity.
- 21.2.7 Identify and explain weld cracking in general.
- 21.2.8 Identify and explain solidification cracking.
- 21.2.9 Identify and explain liquification cracking.
- 21.2.10 Identify and explain poor weld bead profile.

Keys to Employability

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Standard 21: GTAW: Aluminum Plate – Identify and explain the equipment, characteristics, and weld types that apply to gas tungsten arc welding when using aluminum.

Topic 3: Explain GTAW and set up equipment to weld aluminum plate.

Student Competencies

Advanced

- 21.3.1 Identify and explain preparing the welding area.
- 21.3.2 Identify and explain selecting aluminum filler metals.
- 21.3.3 Identify and explain manufacturers' classifications.
- 21.3.4 Identify and explain filler rod sizes.
- 21.3.5 Identify and explain filler metal selection considerations.
- 21.3.6 Identify and explain preparing welding coupons.
- 21.3.7 Identify and explain cutting and cleaning aluminum plate coupons.
- 21.3.8 Identify and explain preparing practice weld coupons.
- 21.3.9 Identify and explain positioning aluminum plate coupons for welding.
- 21.3.10 Identify and explain selecting shielding gas.
- 21.3.11 Identify and explain welding equipment.

Keys to Employability

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills.
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues
- 5. Speaking→ Organizes ideas and communicates orally.

Standard 21: GTAW: Aluminum Plate – Identify and explain the equipment, characteristics, and weld types that apply to gas tungsten arc welding when using aluminum.

Topic 4: Explain and practice GTAW techniques for plate, including padding in the flat position with stringer beads, using aluminum filler metal.

Student Competencies

Advanced

- 21.4.1 Identify and explain torch travel speed and arc length.
- 21.4.2 Identify and explain torch angles.
- 21.4.3 Identify and explain work angle.
- 21.4.4 Identify and explain travel angle.
- 21.4.5 Identify and explain torch and filler metal-handling techniques.
- 21.4.6 Identify and explain freehand technique.
- 21.4.7 Identify and explain walking-the-cup technique.
- 21.4.8 Identify and explain practicing weave beads.
- 21.4.9 Identify and explain weld restarts.
- 21.4.10 Identify and explain weld terminations.
- 21.4.11 Identify and explain overlapping beads.
- 21.4.12 Identify and explain building a pad with stringer or weave beads.

Keys to Employability

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Information

- 1. Acquires and Evaluates Information.
- 2. Organizes and Maintains Information.
- 3. Interprets and Communicates Information.
- 4. Uses Computers to Process Information.

Standard 21: GTAW: Aluminum Plate – Identify and explain the equipment, characteristics, and weld types that apply to gas tungsten arc welding when using aluminum.

Topic 5: Make fillet welds on aluminum plate in 1F, 2F, 3F, and 4F positions.

Student Competencies

Advanced

- 21.5.1 Practice flat 1F position fillet welds.
- 21.5.2 Practice horizontal 2F position fillet welds.
- 21.5.3 Practice vertical 3F position fillet welds.
- 21.5.4 Identify and explain vertical weave bead fillet welds.
- 21.5.5 Identify and explain vertical stringer bead fillet welds.
- 21.5.6 Practice overhead 4F position fillet welds.

Keys to Employability

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Standard 21: GTAW: Aluminum Plate – Identify and explain the equipment, characteristics, and weld types that apply to gas tungsten arc welding when using aluminum.

Topic 6: Make multi-pass open V-groove welds with backing on aluminum plate in the 1G, 2G, 3G, and 4G positions.

Student Competencies

Advanced

- 21.6.1 Identify and explain V-groove root with backing pass techniques.
- 21.6.2 Identify and explain V-groove weld positions.
- 21.6.3 Identify and explain acceptable and unacceptable V-groove welds with backing.
- 21.6.4 Practice flat 1G position V-groove welds with backing.
- 21.6.5 Practice horizontal 2G position V-groove welds with backing.
- 21.6.6 Practice vertical 3G position V-groove welds with backing.
- 21.6.7 Practice overhead 4G position V-groove welds with backing.

Keys to Employability

Technology

- 1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
- 2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
- 3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Standard 21: GTAW: Aluminum Plate – Identify and explain the equipment, characteristics, and weld types that apply to gas tungsten arc welding when using aluminum.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 21: GTAW: Aluminum Plate – Identify and explain the equipment, characteristics, and weld types that apply to gas tungsten arc welding when using aluminum.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.

Mathematics cont.

- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.3. Identify the variable, sample, and population in a well-designed study
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.8. Given a formula list, compute the area of a regular polygon
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions

Standard 21: GTAW: Aluminum Plate – Identify and explain the equipment, characteristics, and weld types that apply to gas tungsten arc welding when using aluminum.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 9-10.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.5. Understand principles governing evolution and equilibrium within systems
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors

Science cont.

- 9-10.3.1. Classify elements according to similar properties.
- 9-10.3.4. Construct a model of an atom
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid

Standard 21: GTAW: Aluminum Plate – Identify and explain the equipment, characteristics, and weld types that apply to gas tungsten arc welding when using aluminum.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy

Standard 22: Shielded Metal Arc Welding (SMAW): Open-Root Pipe Welds – Identify procedures and techniques that apply to open-root pipe welds.

Topic 1: Identify and explain how to prepare arc welding equipment for open-root pipe welds.

Student Competencies

Advanced

- 22.1.1 Explain the common uses of the open-root V-groove pipe weld and discuss electrodes used to make it.
- 22.1.2 Prepare a weld coupon for practicing pipe welds.
- 22.1.3 Demonstrate ASME and API pipe beveling.
- 22.1.4 Demonstrate how to properly grind the inside edge of a bevel.
- 22.1.5 Demonstrate proper use of E6010 and E7018 electrodes.
- 22.1.6 List the steps that must be followed to prepare a welding machine for open-root V-groove pipe welds.
- 22.1.7 Demonstrate amperage settings for various electrode types and sizes.

Keys to Employability

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
- 5. Speaking→ Organizes ideas and communicates orally.

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Systems

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
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Standard 22: Shielded Metal Arc Welding (SMAW): Open-Root Pipe Welds – Identify procedures and techniques that apply to open-root pipe welds.

Topic 2: Identify and explain open-root V-groove pipe welds.

Student Competencies

Advanced

- 22.2.1 Define the 1G-ROTATED (Flat), 2G (Horizontal), 5G (Multiple), and 6G (Multiple Inclined) welding positions.
- 22.2.2 Discuss the harmful effects of arc strikes outside the weld joint.
- 22.2.3 Explain why tack welds and bead restarts should be avoided within the test coupon regions.
- 22.2.4 Discuss the defects that make a pipe weld unacceptable.
- 22.2.5 Explain the purpose of restricting rings in welding tests.
- 22.2.6 Demonstrate how to make open-root V-groove pipe welds in the 1G-ROTATED position using E6010 and E7018 electrodes.
- 22.2.7 Demonstrate the importance of properly attaching workpiece clamps to pipe coupons.
- 22.2.8 Identify guidelines for running filler passes.
- 22.2.9 Emphasize that field-fabricated jack stands must never be used.
- 22.2.10 Demonstrate how to make open-root V-groove pipe welds in the 2G position using E6010 and E7018 electrodes.
- 22.2.11 Demonstrate how to make open-root V-groove pipe welds in the 5G position using E6010 and E7018 electrodes.
- 22.2.12 Demonstrate how to make open-root V-groove pipe welds in the 6G position using E6010 and E7018 electrodes.
- 22.2.13 Practice welding in 1G position with E6010 or E6011 and E7018
- 22.2.14 Practice welding in 2G position with E6010 or E6011 and E7018.
- 22.2.15 Practice welding in 5G position with E6010 or E6011 and E7018.
- 22.2.16 Practice welding in 6G position with E6010 or E6011 and E7018.
- 22.2.17 Learn to take corrective action on identified welding problems.

Keys to Employability

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills
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- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.

Information

- 1. Acquires and Evaluates Information.
- 2. Organizes and Maintains Information.
- 3. Interprets and Communicates Information.
- 4. Uses Computers to Process Information.

Technology

- 1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
- 2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
- 3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Standard 22: Shielded Metal Arc Welding (SMAW): Open-Root Pipe Welds – Identify procedures and techniques that apply to open-root pipe welds.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 22: Shielded Metal Arc Welding (SMAW): Open-Root Pipe Welds – Identify procedures and techniques that apply to open-root pipe welds.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles

Mathematics cont.

- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.6. Calculate probabilities of compound events using addition and multiplication rules
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.3. Use approximations to compare the standard and metric systems of measurement
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.8. Given a formula list, compute the area of a regular polygon
- 9-10.4.9. Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions
- 11-12.5.6. Determine and write an equation for a function that models a mathematical relationship

Standard 22: Shielded Metal Arc Welding (SMAW): Open-Root Pipe Welds – Identify procedures and techniques that apply to open-root pipe welds.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 9-10.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.5. Understand principles governing evolution and equilibrium within systems
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors

Science cont.

- 9-10.3.1. Classify elements according to similar properties.
- 9-10.3.4. Construct a model of an atom
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid

Standard 22: Shielded Metal Arc Welding (SMAW): Open-Root Pipe Welds – Identify procedures and techniques that apply to open-root pipe welds.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy

Standard 23: SMAW: Stainless Steel Groove and Pipe Welds – Explain the preparation, processes, and positions of stainless steel groove pipe welds.

Topic 1: Identify and explain stainless steel metallurgy.

Student Competencies

Advanced

- 23.1.1 Identify and explain stainless steel categories.
- 23.1.2 Identify and explain austenitic stainless steel.
- 23.1.3 Identify and explain martensitic stainless steel.
- 23.1.4 Identify and explain ferritic stainless steel.
- 23.1.5 Identify and explain carbide precipitation and hot cracking.
- 23.1.6 Identify and explain stabilized base metal and filler metal.
- 23.1.7 Identify and explain low-carbon base metal and filler metal.
- 23.1.8 Identify and explain post-weld heat treatment (PWHT).
- 23.1.9 Identify and explain hot cracking.
- 23.1.10 Identify and explain AISI stainless steel table.

Keys to Employability

Thinking Skills

- 1. Creative Thinking→ Generates new ideas.
- 2. Decision Making→ Specifies goals and constraints, generates alternatives, considers risks, and evaluates and chooses best alternative.
- 3. Problem Solving→ Recognizes problems and devises and implements plan of action.
- 4. Seeing Things in the Mind's Eye→ Organizes, processes symbols, pictures, graphs, objects, and other information.
- 5. Knowing How to Learn→ Uses efficient learning techniques to acquire and apply new knowledge and skills.
- 6. Reasoning→ Discovers a rule or principle underlying the relationship between two or more objects and applies it when solving a problem.

Standard 23: SMAW: Stainless Steel Groove and Pipe Welds – Explain the preparation, processes, and positions of stainless steel groove pipe welds.

Topic 2: Identify and explain the selection of electrodes for welding stainless steel.

Student Competencies

Advanced

- 23.2.1 Identify and explain AWS filler metal specification system.
- 23.2.2 Identify and explain classification system.
- 23.2.3 Identify and explain usability designation – 15.
- 23.2.4 Identify and explain usability designation – 16.
- 23.2.5 Identify and explain usability designation –17.
- 23.2.6 Identify and explain usability designation –25.
- 23.2.7 Identify and explain usability designation –26.
- 23.2.8 Identify and explain alloy designation.
- 23.2.9 Identify and explain manufacturers’ classifications.
- 23.2.10 Identify and explain storing stainless steel electrodes.
- 23.2.11 Identify and explain electrode selection considerations.
- 23.2.12 Identify and explain WPS requirement.
- 23.2.13 Identify and explain base metal composition.

Keys to Employability

Personal Qualities

- 1. Responsibility→ Exerts a high level of effort and perseveres towards goal attainment.
- 2. Self-Esteem→ Believes in own self worth and maintains a positive view of self.
- 3. Sociability→ Demonstrates understanding, friendliness, adaptability, empathy, and politeness in group setting.
- 4. Self-Management→ Assesses self accurately, sets personal goals, monitors progress, and exhibits self-control.
- 5. Integrity/Honesty→ Chooses ethical courses of action.

Standard 23: SMAW: Stainless Steel Groove and Pipe Welds – Explain the preparation, processes, and positions of stainless steel groove pipe welds.

Topic 3: Identify and explain welding variation for stainless steel.

Student Competencies

Advanced

- 23.3.1 Identify and explain welding austenitic stainless steels.
- 23.3.2 Identify and explain welding martensitic stainless steels.
- 23.3.3 Identify and explain welding ferritic stainless steels.
- 23.3.4 Identify and explain welding carbon steels to stainless steels.

Keys to Employability

Information

- 1. Acquires and Evaluates Information.
- 2. Organizes and Maintains Information.
- 3. Interprets and Communicates Information.
- 4. Uses Computers to Process Information.

Standard 23: SMAW: Stainless Steel Groove and Pipe Welds – Explain the preparation, processes, and positions of stainless steel groove pipe welds.

Topic 4: Identify the steps to prepare arc welding equipment for stainless steel welds.

Student Competencies

Advanced

- 23.4.1 Identify and explain safety practices.
- 23.4.2 Identify and explain protective clothing and equipment.
- 23.4.3 Identify and explain fire/explosion prevention.
- 23.4.4 Identify and explain work area ventilation.
- 23.4.5 Identify and explain preparing the welding area.
- 23.4.6 Identify and explain preparing the practice weld coupons.
- 23.4.7 Identify and explain electrodes.
- 23.4.8 Identify and explain preparing the welding machine.

Keys to Employability

Basic Skills

- 1. Reading→ Locates, understands, and interprets written information in prose and in documents such as manuals, graphs, and schedules.
- 2. Writing→ Communicates thoughts, ideas, information, and messages in writing; and creates documents such as letters, directions, manuals, reports, graphs, and flow charts.
- 3. Arithmetic/Mathematics→ Performs basic computations and approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- 4. Listening→ Receives, attends to, interprets, and responds to verbal messages and other cues.
- 5. Speaking→ Organizes ideas and communicates orally.

Standard 23: SMAW: Stainless Steel Groove and Pipe Welds – Explain the preparation, processes, and positions of stainless steel groove pipe welds.

Topic 5: Explain stainless steel open-root V-groove welds.

Student Competencies

Advanced

- 23.5.1 Identify and explain root pass.
- 23.5.2 Identify and explain groove weld positions.
- 23.5.3 Identify and explain acceptable and unacceptable groove weld profiles.

Keys to Employability

System

- 1. Understands Systems→ Knows how social, organizational, and technological systems work and operates effectively with them.
- 2. Monitors and Corrects Performance→ Distinguishes trends, predicts impacts on system operations, diagnoses deviations in systems' performance and corrects malfunctions.
- 3. Improves or Designs Systems→ Suggests modifications to existing systems and develops new or alternative systems to improve performance.

Standard 23: SMAW: Stainless Steel Groove and Pipe Welds – Explain the preparation, processes, and positions of stainless steel groove pipe welds.

Topic 6: Demonstrate SMAW on stainless steel open-root V-groove joints in 1G, 2G, 3G, and 4G positions.

Student Competencies

Advanced

- 23.6.1 Practice flat 1G position open-root v-groove welds.
- 23.6.2 Practice horizontal 2G position open-root V-groove welds.
- 23.6.3 Practice vertical 3G position open-root V-groove welds.
- 23.6.4 Practice overhead 4G position open-root V-groove welds.

Keys to Employability

Resources

- 1. Time→ Selects goal-relevant activities, ranks them, allocates time, and prepares and follows schedules.
- 2. Money→ Uses or prepares budgets, makes forecasts, keeps records, and makes adjustments to meet objectives.
- 3. Material and Facilities→ Acquires, stores, allocates, and uses materials or space efficiently.
- 4. Human Resources→ Assesses skills and distributes work accordingly, evaluates performance and provides feedback.

Standard 23: SMAW: Stainless Steel Groove and Pipe Welds – Explain the preparation, processes, and positions of stainless steel groove pipe welds.

Topic 7: Explain stainless steel open-root V-groove pipe welds.

Student Competencies

Advanced

- 23.7.1 Prepare practice pipe weld coupons.
- 23.7.2 Identify and explain root pass.
- 23.7.3 Identify and explain pipe groove weld test positions.
- 23.7.4 Practice tack welds and restarts on 5G and 6G coupons.
- 23.7.5 Identify and explain acceptable and unacceptable pipe weld profiles.

Keys to Employability

Technology

- 1. Selects Technology→ Chooses procedures, tools, or equipment including computers and related technologies.
- 2. Applies Technology to Task→ Understands overall intent and proper procedures for setup and operation of equipment.
- 3. Maintains and Troubleshoots Equipment→ Prevents, identifies, or solves problems with equipment, including computers and other technologies.

Standard 23: SMAW: Stainless Steel Groove and Pipe Welds – Explain the preparation, processes, and positions of stainless steel groove pipe welds.

Topic 8: Demonstrate SMAW on stainless steel open-root V-groove pipe welds in 1G-ROTATED, 2G, 5G, and 6G positions.

Student Competencies

Advanced

- 23.8.1 Practice flat 1G-ROTATED position open-root V-groove pipe welds.
- 23.8.2 Practice horizontal 2G position open-root V-groove pipe welds.
- 23.8.3 Practice multiple 5G position open-root V-groove pipe welds.
- 23.8.4 Practice inclined multiple 6G position open-root V-groove pipe weld.

Keys to Employability

Interpersonal

- 1. Participates as a Member of a Team→ Contributes to group effort.
- 2. Teaches Others New Skills.
- 3. Serves Clients/Customers→ Works to satisfy customers' expectations.
- 4. Exercises Leadership→ Communicates ideas to justify position, persuades and convinces others, responsibly challenges existing procedures and policies.
- 5. Negotiates→ Works toward agreements involving exchange of resources; resolves divergent interests.
- 6. Works with Diversity→ Works well with men and women from diverse backgrounds.



Standard 23: SMAW: Stainless Steel Groove and Pipe Welds – Explain the preparation, processes, and positions of stainless steel groove pipe welds.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 23: SMAW: Stainless Steel Groove and Pipe Welds – Explain the preparation, processes, and positions of stainless steel groove pipe welds.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest
- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles

Mathematics cont.

- 9-10.3.1. Construct appropriate displays of given data
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.6. Calculate probabilities of compound events using addition and multiplication rules
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.3. Use approximations to compare the standard and metric systems of measurement
- 9-10.4.4. Given a conversion factor, convert between standard and metric measurements
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.9. Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.4. Perform the operations of addition, subtraction, multiplication, and division on algebraic functions
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions
- 11-12.5.6. Determine and write an equation for a function that models a mathematical relationship

Standard 23: SMAW: Stainless Steel Groove and Pipe Welds – Explain the preparation, processes, and positions of stainless steel groove pipe welds.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 9-10.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.5. Understand principles governing evolution and equilibrium within systems
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors

Science cont.

- 9-10.3.1. Classify elements according to similar properties.
- 9-10.3.4. Construct a model of an atom
- 9-10.3.5. Recognize the reactants and products in a chemical reaction
- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid

Standard 23: SMAW: Stainless Steel Groove and Pipe Welds – Explain the preparation, processes, and positions of stainless steel groove pipe welds.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy

Standard 24: Fabrication – Identify and practice basic fabrication skills.

Topic 1: Identify basic concepts of fabrication.

Student Competencies

Keys to Employability

Core

- 24.1.1. Lay out material for plate and structural fabrication.
- 24.1.2. Identify joint design so as to prepare material for specific weld procedure.
- 24.1.3. Lay out material for pipe fabrication.
- 24.1.4. Set up fabrication equipment.
- 24.1.5. Perform basic shear operation.
- 24.1.6. Perform basic bend operation.
- 24.1.7. Perform basic punch operation.



Standard 24: Fabrication – Identify and practice basic fabrication skills.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 24: Fabrication – Identify and practice basic fabrication skills.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest

Mathematics cont.

- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.1. Construct appropriate displays of given data
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.3. Identify the variable, sample, and population in a well-designed study
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.6. Calculate probabilities of compound events using addition and multiplication rules
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.3. Use approximations to compare the standard and metric systems of measurement
- 9-10.4.4. Given a conversion factor, convert between standard and metric measurements
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.8. Given a formula list, compute the area of a regular polygon
- 9-10.4.9. Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.4. Perform the operations of addition, subtraction, multiplication, and division on algebraic functions
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions
- 11-12.5.6. Determine and write an equation for a function that models a mathematical relationship

Standard 24: Fabrication – Identify and practice basic fabrication skills.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 9-10.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.6. Understand how scientists create and use models to address scientific knowledge
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors

Science cont.

- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.4. Explain how science and technology can influence personal, industrial, and cultural decision-making
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid

Standard 24: Fabrication – Identify and practice basic fabrication skills.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy

Standard 25: Metallurgy – Recognize and use principles of metallurgy.

Topic 1: Identify basic concepts of Metallurgy.

Student Competencies

Core

- 25.1.1 Maintain a safe work environment.
- 25.1.2 Practice shop safety procedures.
- 25.1.3 Apply principles of metallurgy to anneal.
- 25.1.4 Apply principles of metallurgy to harden.
- 25.1.5 Apply principles of metallurgy to temper.
- 25.1.6 Test metal to identify characteristics.
- 25.1.7 Test metal to identify welding requirements.
- 25.1.8 Recondition a drill bit.

Advanced

Keys to Employability



Standard 25: Metallurgy – Recognize and use principles of metallurgy.

Academic Cross Walk

English Language Arts

- 9.1.2. Formulate a preliminary thesis statement
- 9.1.3. Cross-reference information
- 9.1.4. Evaluate relevancy of information
- 9.1.5. Organize information from a variety of sources; e.g., chronological
- 9.1.7. Identify and avoid plagiarism
- 9.1.8. Use primary and secondary sources
- 10.1.2. Know ways to effectively search electronic databases; e.g., defining key terms and using limiters to focus a search
- 10.1.7. Paraphrase information
- 11.1.1. Research topics independently using appropriate sources
- 11.1.4. Verify the quality, accuracy, and usefulness of information
- 11.1.5. Synthesize information in a logical sequence
- 11.1.7. Evaluate the research process and develop strategies for improving it; e.g., correct use of research format, accuracy of research, organization of information and use of sources
- 9.2.5. Locate redundancies in written texts to clarify meaning
- 9.2.7. Access prior knowledge to interpret meaning
- 9.2.8. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 9.2.12. Explain ways in which the setting affects the development of a story
- 9.2.15. Build vocabulary by reading a variety of grade-level texts and applying new vocabulary
- 10.2.3. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 10.2.7. Apply universal themes to real life situations
- 11.2.6. Apply prior knowledge
- 12.2.4. Read for a variety of purposes and intents; e.g., to become life-long readers, to model forms of writing, etc.
- 12.2.8. Use technical language/jargon to decipher meaning
- 9.3.8. Use supporting details
- 9.3.11. Arrange paragraphs in a logical progression
- 10.3.3. Use prewriting techniques to generate ideas
- 10.3.4. Organize the ideas and details of a composition according to purpose

English Language Arts cont.

- 10.3.7. Use a variety of supporting details
- 10.3.10. Use a specific point of view in compositions
- 10.3.13. Use knowledge of sentence structure and sentence construction to edit and revise text
- 11.3.5. Use a variety of supporting details
- 9.4.4. Engage in a group discussion
- 9.4.5. Use critical listening skills; i.e., reflection
- 10.4.3. Formulate questions in response to a verbal message
- 12.4.4. Use critical listening responses such as refutation and commentary, to critique the accuracy of messages
- 9.5.1. Identify existing and developing media
- 10.5.1. Identify existing and developing media
- 11.5.1. Identify existing and developing media
- 12.5.1. Identify existing and developing media

Standard 25: Metallurgy – Recognize and use principles of metallurgy.

Academic Cross Walk

Mathematics

- 9-10.1.1. Express numbers between one-billionth and one billion in fraction, decimal, and verbal form; express numbers of all magnitudes in scientific notation
- 9-10.1.2. Describe the hierarchical relationships among subsets of the real number system
- 9-10.1.3. Identify the properties of the real number system
- 9-10.1.5. Use the order of operations to simplify an algebraic expression
- 9-10.1.6. Analyze the effects of multiplication, division, raising to a power, and extracting a root on the magnitudes of quantities
- 9-10.1.7. Apply basic properties of exponents to simplify algebraic expressions
- 9-10.1.8. Apply estimation skills to predict realistic solutions to problems
- 9-10.1.9. Select and use an appropriate computational technique to solve problems involving real numbers
- 9-10.1.10. Explain the reasonableness of a problem's solution and the process used to obtain it
- 9-10.1.11. Add, subtract, and perform scalar multiplication on matrices
- 11-12.1.3. Use imaginary numbers to express the square root of a negative number
- 11-12.1.4. Justify the steps of an algebraic process using the properties of the real number system.
- 11-12.1.5. Determine which properties of the real number system hold for matrices
- 11-12.1.6. Apply basic properties of exponents and logarithms to rewrite algebraic expressions
- 11-12.1.7. Add, subtract, and multiply complex numbers
- 11-12.1.8. Multiply matrices containing no more than three rows or columns without the use of technology
- 8.2.8. Use two-dimensional representations of three-dimensional objects to visualize and solve problems
- 9-10.2.1. Identify the properties and attributes of two- and three-dimensional objects that distinguish one from another
- 9-10.2.2. Determine congruence and similarity among geometric objects
- 9-10.2.3. Use trigonometric relationships and the Pythagorean Theorem to determine side lengths and angle measures in right triangles
- 9-10.2.5. Use Cartesian coordinates to determine distance, midpoint, and slope
- 9-10.2.6. Use distance, midpoint, and slope to establish relationships between points, lines, and plane figures in the Cartesian coordinate system
- 9-10.2.7. Identify and perform transformations of objects in the plane using sketches (translations, reflections, rotations, dilations) and coordinates (translations, reflections, dilations)
- 9-10.2.8. Analyze the effects of combining basic transformations in a plane.
- 9-10.2.9. Construct plane figures using traditional and/or technological tools
- 9-10.2.10. Given a two-dimensional image of a three-dimensional object, recognize images of the same object shown from different perspectives
- 9-10.2.11. Use geometric models to gain insights into, and to answer questions in, other areas of mathematics, other disciplines, and other areas of interest

Mathematics cont.

- 11-12.2.1. Use trigonometric relationships to determine side lengths and angle measures in triangles
- 9-10.3.1. Construct appropriate displays of given data
- 9-10.3.2. Interpret a given visual representation
- 9-10.3.3. Identify the variable, sample, and population in a well-designed study
- 9-10.3.4. Determine the number of possible outcomes for a given event, using appropriate counting techniques
- 9-10.3.5. Calculate experimental and theoretical probabilities with and without replacement
- 9-10.3.6. Calculate probabilities of compound events using addition and multiplication rules
- 9-10.3.9. Select two points and approximate an equation for the line of best fit (if appropriate) for a set of data
- 11-12.3.2. Make predictions based on theoretical probabilities and experimental results
- 11-12.3.4. Given a set of data exhibiting a linear trend, approximate an equation for the line of best fit (with or without technology) and use that model to make predictions
- 9-10.4.1. Select appropriate units and scales for problem situations involving measurement
- 9-10.4.2. Describe the effects of scalar change on the area and volume of a figure
- 9-10.4.3. Use approximations to compare the standard and metric systems of measurement
- 9-10.4.4. Given a conversion factor, convert between standard and metric measurements
- 9-10.4.5. Use methods necessary to achieve a specified degree of precision and accuracy in measurement situations
- 9-10.4.6. Employ estimation techniques to evaluate reasonableness of results in measurement situations
- 9-10.4.8. Given a formula list, compute the area of a regular polygon
- 9-10.4.9. Given a formula list, compute the surface area and volume of a right prism, right cylinder, right pyramid, right cone, and sphere
- 9-10.4.10. Apply indirect measurement techniques to solve problems involving irregular shapes or inaccessible objects
- 9-10.5.2. Express relations and functions using a variety of representations
- 9-10.5.4. Perform the operations of addition, subtraction, multiplication, and division on algebraic functions
- 9-10.5.7. Develop algebraic expressions or equations involving one or two variables to represent relationships found in various contexts (time and distance problems, mixture problems, etc.)
- 9-10.5.13. Interpret a graphical representation of a real-world situation
- 9-10.5.14. Draw conclusions about a situation being modeled
- 11-12.5.1. Perform advanced operations on algebraic functions
- 11-12.5.4. Use transformations to graph linear, quadratic, and absolute value functions
- 11-12.5.6. Determine and write an equation for a function that models a mathematical relationship

Standard 25: Metallurgy – Recognize and use principles of metallurgy.

Academic Cross Walk

Science

- 9-10.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 9-10.1.3. Understand the relationship between form and function
- 9-10.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.1. Understand the structure, organization, and dynamics of components within a system
- 11-12.1.2. Understand how a system can be dynamic yet may remain in equilibrium
- 11-12.1.3. Understand the relationship between form and function
- 11-12.1.4. Know how classification can be based on the relationship between form and function
- 11-12.1.5. Understand principles governing evolution and equilibrium within systems
- 11-12.1.6. Understand how scientists create and use models to address scientific knowledge
- 9-10.2.1. Use appropriate safety equipment and precautions during investigations
- 9-10.2.2. Identify questions and concepts that guide scientific investigations
- 9-10.2.4. Identify the independent and dependent variables, the control, and the constants when conducting an experiment
- 9-10.2.7. Analyze data found in tables, charts, and graphs to formulate conclusions
- 11-12.2.2. Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations
- 11-12.2.4. Formulate and revise explanations based upon scientific knowledge and experimental data
- 11-12.2.5. Use technology and mathematics to improve investigations and communications
- 11-12.2.6. Analyze data using appropriate strategies
- 11-12.2.8. Communicate and defend a scientific argument
- 11-12.2.9. Understand that scientific explanations must adhere to criteria
- 11-12.2.10. Understand that new knowledge and methods emerge from different types of investigations and public communication among scientists
- 8.3.6. Understand waves have characteristic properties and behaviors
- 9-10.3.1. Classify elements according to similar properties.
- 9-10.3.4. Construct a model of an atom
- 9-10.3.5. Recognize the reactants and products in a chemical reaction

Science cont.

- 9-10.3.11. Recognize the relationships between kinetic and potential energy in basic transformations
- 11-12.3.8. Understand the principles and relationships influencing forces and motion
- 11-12.3.13. Apply the law of conservation of energy to a variety of situations
- 11-12.3.14. Understand how energy is related to physical changes of matter
- 8.5.5. Know a variety of methods can be used to determine geological time
- 8.5.6. Understand the changes Earth has undergone over geologic time
- 9-10.5.1. Compare and contrast the most widely accepted scientific theories explaining the origin and evolution of the universe
- 11-12.5.2. Understand how Earth systems are in dynamic equilibrium
- 9-10.6.1. Use appropriate technologies and techniques to solve a problem
- 9-10.6.2. Know how scientific principles have been used to create common technologies
- 11-12.6.1. Select and use appropriate technologies, tools, and techniques to solve a problem
- 11-12.6.3. Explain how designing and implementing technology requires weighing trade-offs between positive and negative impacts on humans and the environment
- 9-10.7.1. Understand how personal health is related to fitness, substance abuse, sexual activity, and nutrition
- 9-10.7.2. Understand factors that affect populations
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 11-12.7.1. Know the impact of environmental laws and policies on the environment and society
- 11-12.7.2. Explain ways renewable and nonrenewable resources are managed
- 9-10.8.2. Understand how views and attitudes have influenced the development of science
- 9-10.8.3. Understand the role of scientists in theoretical and applied science
- 9-10.8.4. Understand how human characteristics influence scientific advancement
- 11-12.8.1. Know the criteria that scientific explanations must meet to be considered valid

Standard 25: Metallurgy – Recognize and use principles of metallurgy.

Academic Cross Walk

Library Media/Technology Literacy

Library Media/Technology Literacy



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